

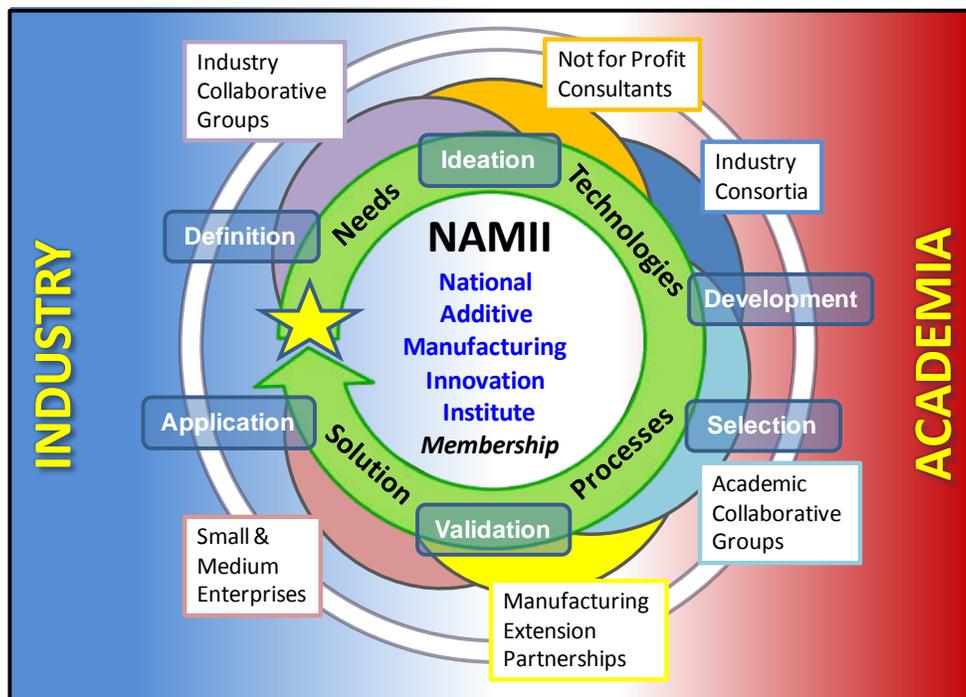
NNMI RFI Input from The Timken Company

The Timken Company has been an active participant on the Northeast Ohio manufacturing innovation team. Timken attended the NNMI workshops and was a significant contributor to the Tech Belt's proposal. Since the National Additive Manufacturing Innovation Institute (NAMII) pilot was announced, the company has supported the team's organizational efforts and has become a Tier 2 member of NAMII. Timken will continue to provide industry's perspective by participating on the Governance Board as well as by offering technical direction via the roadmapping effort.

Timken endorses the RFI response provided by the Northeast Ohio proposal partners, and offers these additional comments. Timken has been a long-time participant in industry consortia and collaborative groups aimed at providing technology solutions to support industry. The company's consistent message has been that the efforts of those groups should focus on pre-competitive topics, allowing industrial members to take those solutions to market.

Timken believes that NAMII and any other institutes should be similarly charged to develop technologies and supporting capabilities that enable industry small and large to better compete in world markets. Developmental efforts should be focused on customer or market needs defined largely by industry. Timken has offered a unifying graphic to summarize a collaborative model and project lifecycle. That graphic is accompanied by a descriptive commentary below.

Collaborative Development Model & Project Lifecycle



NAMII Commentary

The associated graphic illustrates the lifecycle of projects and the method by which the National Additive Manufacturing Innovation Institute (NAMII) will execute them.

- The NAMII membership is represented by the circle at the core which signifies that requestors will be encouraged to become NAMII members to take advantage of the institute's capabilities.
- The blended blue to red background illustrates the seamless collaboration that will take place between industry with their larger role on commercial tasks in the blue to the left, and academia which may have a larger part in red technical tasks to the right.
- Customer **needs** will largely be defined by industry as represented by the green arrowed ring representing the cycle with its beginning at the star.
- Along the green ring, ideation and development of **technologies** will lead to selection of **processes** that can be validated as providing the **solution** meeting the needs of the **application**.
- The boxes with colored frames illustrate collaborative partners who may engage at various stages during the lifecycle to provide definition, enable technology development or facilitate commercialization and job creation.
- The white enclosing ring illustrates the mandate for NAMII to train and educate the U.S. workforce in manufacturing in general, and additive manufacturing, in particular.

The collection of the needs will lead to compilation of a roadmap which will be used by NAMII as the subject in its calls for project proposals.

Timken notes that while large industry members should pay their fair share, they do not have the 'deep pockets' that would allow them to carry the burden of financing the sustainability of the institutes. In fact, such companies likely will be managing a limited R&D budget to invest in a potentially broad portfolio of opportunities. Effective use of a roadmapping process is essential to making the best choices for topics for the institutes as well as for projects within each institute to deliver the best return on investment.

In addition, content mapping principles should be employed to confirm that an effective set of topics is chosen for focus areas of the institutes to ensure effective operation promoting synergies while limiting overlap and interference. Some focus areas and topics that Timken would suggest include: materials characterization to measure performance properties of new materials; composite materials to develop manufacturing of any type of composite material (e.g., reinforced polymers, certain ceramics and composite coatings); a laser topic aimed at laser-based processing (e.g., heat treatment, cutting, joining and measurement); a non-destructive evaluation topic working on fundamental electromagnetic responses (including ultrasonics and electrical resistivity), and a superconductivity focus area.

Finally, Timken has favored the use of government or collaboration funding to finance high risk projects that are beyond the means of even the largest companies. The institutes could provide such capabilities by financing difficult development topics or new equipment that may be revolutionary, but are beyond a company's risk tolerance limit.