



UNITED STATES MANUFACTURING COUNCIL

August 3, 2016

The Honorable Penny Pritzker
Secretary of Commerce
United States Department of Commerce
Washington, DC 20230

Dear Madam Secretary,

On January 20, 2016 the Manufacturing Council wrote to you endorsing the establishment of a National Network for Manufacturing Innovation (NNMI) and providing a series of implementation recommendations for the Department of Commerce (Commerce) to consider. We have been closely following the evolution of the Network and are very pleased to see these recommendations being implemented and bearing fruit as the existing institutes grow and new Centers are established.

We now are writing to offer a series of recommendations regarding best practices and lessons learned based on multiple stakeholder interviews including leaders of the existing centers. Specifically, our focus is to further a sustainable and scalable program by ensuring the enduring support of the network's industrial partners through the creation of shared value between industry and the Centers.

As a public-private partnership, there are critical roles in the network to be played by the public sector, academia, and the industrial commons. The benefit of the network is clear to the academic community, as it brings in research funding from both public and private sources. The benefits to the public sector in terms of job creation and workforce development are also clear. For the industrial sector to invest in the network, however, the value proposition must be made clear and kept in the forefront of Center operations, strategy, and governance.

A stated, fundamental goal of the NNMI is to address the so-called, "valley of death" in which research advances often fail to find a path to commercialization. To succeed, it is critical that the NNMI focus energy and attention on the conditions which encourage manufacturers of all sizes and from all market segments to participate vigorously.

The following recommendations are meant to serve as best-practice guides to creating a compelling value proposition for industry participation in both new and existing centers. We believe implementation of these practices will ensure that the NNMI successfully grows in scale and that the work of these critical centers will continue to serve the nation for years to come.

Our white paper is organized into the follow sections:

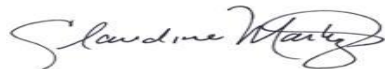
- Organization and Operations – How centers are structured and operate
- Research Portfolio Definition – How projects are selected and carried out
- Intellectual Property – How centers should treat IP
- Sustainability – Practices to foster network collaboration and promote long-term success

We have greatly appreciated the opportunity to contribute to the network operations through our January letter and our engagements with your partners in the Department of Defense and the Department of Energy. Additionally, we greatly appreciate the thoughtful and energetic approach taken by Commerce to nurturing the Network and fostering its growth, and look forward to a continuing successful partnership.

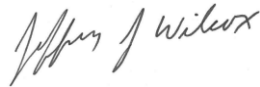
Respectfully submitted,



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ATTACHMENT: Innovation, Research, and Development Subcommittee Report



UNITED STATES MANUFACTURING COUNCIL

Shaping the Future of the National Network for Manufacturing Innovation (NNMI)

Best Practices for Promoting NNMI Success

Department of Commerce Manufacturing Council

Innovation, Research & Development Subcommittee Report

July 2016

Report Overview

The National Network for Manufacturing Innovation (NNMI) is a network of public-private partnerships designed to significantly enhance the competitiveness of the manufacturing sector and of the United States economy as a whole. The long-term sustainability and success of the NNMI and its constituent centers will depend heavily on how each center organizes and operates as it interacts both with its members and its government sponsors.

The first institutes established within the NNMI have employed a variety of different operating models. This white paper, based on our interactions with network stakeholders, outlines a series of recommendations and best practices that we find to be foundational to the success of each center and to the Network as a whole. The recommendations provided in this white paper align with the following fundamental themes that we believe are critical to NNMI mission success:

- Simplifying member engagement with the NNMI and each center
- Maintaining a strong value proposition for all members
- Focusing on meeting industry challenges and commercialization of new capabilities
- Leveraging the potential synergy to be achieved from collaboration between network centers, and
- Ensuring long-term network sustainability

Finally, this white paper builds on the Manufacturing Council letter of January 20, 2016, which strongly endorsed the establishment of the NNMI and made recommendations relating to the project application process.

Section 1: Institute Organization and Operations

At Each Center, Establish a Member-Driven Committee Structure to Guide Decision Making

The membership must be actively involved in strategic planning and operational decision making to ensure the institute continues to serve the needs of its members. Establishing a set of committees that guide institute decision making has proven to be very effective at multiple institutes to date. At a minimum, each institute should establish the following committees, with chairs and vice-chairs elected by the membership:

Executive Committee – Makes strategic and operational decisions to ensure the institute continues to serve the membership. Topics addressed by this committee include items such as the institute membership agreement, IP rights management, changes in the membership fee structure, topic areas for future research, etc. Committee membership must represent the entire institute membership, but higher tier members should have greater representation and influence due to their increased level of commitment and engagement with the institute. Considering the financial commitment of tier one members, these members should likely be afforded a guaranteed seat on the Executive Committee. We highly recommend that the Executive Committee should be a separate entity from the Board of Directors of the 501(c)(3) non-profit organization that is awarded the contract to operate the institute.

Technical Advisory Committee – Ensures that institute research aligns with key industry priorities. Typical activities for this committee include items such as technology road mapping and collaboration, shaping the topic areas for project calls, and evaluating candidate projects.

Additional committees focused on other important topics such as workforce development and institute sustainment also have been valuable at existing institutes, but may or may not be needed at every institute. The Executive Committee and institute leadership should work together to determine any additional committees that are appropriate.

Allow Institute Members to Contract Directly With the Institute Rather than Requiring Subcontracting With Each Other on Projects

Each institute is well positioned to reduce project launch and execution timelines by managing all subcontracting directly with project team members. Every institute member typically has its own subcontracting process and standard terms and conditions, and putting subcontracts in place between team members can be very time consuming and expensive. Furthermore, in a research consortium setting where members are pooling resources to achieve common goals rather than competing with each other to secure contracts, there is little appetite among institute members to assume the liability of an underperforming subcontractor. Establishing a standard contracting process for all members to contract directly with the institute alleviates these liability concerns, and also results in a dramatically faster project launch.

Streamline In-Kind Reporting

Each current institute employs a slightly different process for reporting in-kind support. Ideally, all in-kind support to the institute would be submitted in a single report to the institute every month, with support to specific projects clearly broken out. Some institutes currently require separate reports to be provided to each organization leading a project in addition to a report that is provided directly to the institute. This is cumbersome and inefficient, and quickly becomes challenging if an organization is a member of multiple NNMI institutes.

Make Matching Project Funding Available to All Institute Project Participants

Within the current institutes, there is inconsistency in determining who is eligible to receive matching federal project funding. At several institutes, federal funding is allocated almost exclusively to the technology centers or labs affiliated with the institute. At other institutes, all members are eligible to compete for federal funding (typically via 1:1 matching) through open project calls. Although the receipt of matching funding may not be a top priority for large industry members, matching funding can be critically important to small and medium size companies and academia. In fact, it appears that the opportunity to receive matching funding is often a primary reason these organizations join the institute. Restricting the use of institute matching funding to institute technology centers only restricts the scope of what can be accomplished on institute projects. As a result, it is critically important that all institute members be eligible to receive matching institute project funding to ensure the institute is truly addressing the most industry-relevant challenges.

Promote Awareness-Building Communications

As referenced in the Manufacturing Council letter of January 20, 2016, Institutes should include outreach communications as a function of their standard operations. Project topics, research outcomes and other appropriate notices of technical and business progress should be routinely communicated to relevant SMEs, supply chains, trade organizations, etc.

In order to ensure public awareness of the impacts of the entire program, these communications should include references to the NNMI program as a whole. Drawing on materials agreed upon by all the agencies funding institutes in the NNMI, DOC/NIST should provide the institutes a logo, taglines, descriptive text about the program, etc. The institutes should include these elements in their communications with industry, trade organizations, and the media.

Maintain Significant Differentiation in Membership Levels and Benefits

Multiple tiers of membership are critical for Institute success, as the ability to join varies significantly among organizations with revenue and size playing major roles. SMEs, start-ups, Fortune 100 companies and universities all have different abilities to pay membership fees. Typically, Institute memberships are offered at multiple tier levels, with fees and privileges varying depending on the level selected. Given that the NNMI have the fundamental goals of economic growth, technology acceleration and workforce development for all levels and types of organizations, it is important that minimum fee levels be sufficiently modest to enable

organizations of varying sizes to participate. It is also important that lower tiers of membership have sufficient privileges to make them valuable and attractive.

Tier one industry membership currently ranges from \$200k to \$1M per year (membership fee plus required in-kind support) at each institute, with second tier industry membership typically 75% less. Compared to traditional research consortia, the financial commitment to join an NNMI institute as a tier one industry member is very high. To justify an investment at the tier one level, unique differentiation must exist between benefits associated with different membership levels. Typical industry expectations for a tier one membership include:

- Participation in institute strategic decision making via guaranteed seats on institute governance boards and committees
- Increased influence on institute project portfolio definition, either by increased voting allotment on priority topics or increased weighting on project proposals
- Improved IP rights and access to results from all institute funded projects (consistent with institute IP management plan)
- Preferred or discounted access to institute expertise (technical consulting) and capital assets (labs and equipment)

Without significant differentiation in membership benefits, it will be difficult to retain tier one industry members for the long term. In addition, if lower tier investment levels are too high, inclusion of the broad base start-ups and small and mid-sized manufacturers will be limited. Institutes should consider establishing lower tier rates at affordable levels for start-ups and SMEs (for example, \$5-10K) that encourage both inclusion in communications, networking events and project call participation. As an example, DMDII has demonstrated broad Industry and SME participation with its membership level structure, featuring a Tier 3 industry membership fee of only \$500¹.

Section 2: Research Portfolio Definition

Require at Least Two Industry Sponsors for All Funded Research Projects to Ensure Industry-Relevance

One of the foundational objectives of the NNMI is to solve industry-relevant problems. As a result, each institute must ensure that its project definition process is driven largely by industry members. Any project lacking sponsorship from two or more industry members may not adequately address an industry-relevant problem, and will likely struggle to achieve the goal of commercializing a new technology or capability.

Develop Institute-Level Technology Roadmaps to Maintain Alignment Between Industry Needs, Academic Research and Institute Projects

Each NNMI institute is well positioned to build connections and relationships between institute members from industry and academia. Some of the current NNMI institutes have held extensive technology road mapping exercises, which have the dual benefit of capturing industry needs and

¹ “DMDII Membership” <http://dmdii.uilabs.org/membership/become-a-member>

also capturing emerging technologies and research results from academia. By combining these two streams of data, the institute can shape its research portfolio around the most promising and most industry-relevant topic areas. We, therefore, strongly recommend that all NNMI institutes include technology roadmapping in their annual business rhythm.

Require All Institute Funded Projects to Include a Well-Defined Transition Plan to Ensure Capabilities are Commercialized

A foundational objective of the NNMI is to nurture manufacturing innovation and accelerate commercialization.² To achieve this, all projects selected for institute funding should have a well-defined transition plan and a high probability of commercialization. Successful commercialization can be achieved in two primary ways. The first entails new data or methods that the project members can simply adopt into their current manufacturing processes. The second involves maturing new functionality that is incorporated into a product made available commercially by one of the team members in the future. Demonstrating a successful research result in a university lab has significantly more benefit to industry members if they have the ability to leverage this new capability within their supply chain or on their own manufacturing floor.

Avoid Traditional Competitive Project Calls that Require Significant Proposal Development Costs that Do Not Qualify as In-Kind Institute Support

Once an institute has been established, identifying individual projects is a very significant activity. For project selection, a traditional competitive RFP and proposal process typically requires a substantial effort to assemble a team and draft a competitive proposal. The costs associated with proposal development are typically characterized as “Bid and Proposal” (B&P) costs and are not eligible in-kind contributions to the institute per the Department of Defense General Acquisition Regulations (DoDGARs). Although not all institutes are funded and governed by DoD regulations, the concern regarding B&P funding persists and affects industry ability to participate in NNMI projects. Within industry, B&P funding can be very constrained and it can be hard to justify a significant B&P outlay to pursue an NNMI project that will not yield a profit if awarded. As a result, current institute members have expressed substantial reluctance to lead project proposal efforts due to the significant associated workload and cost. An alternative approach that addresses this issue involves:

- The institute leadership and members working together to identify and down-select the highest priority project topics;
- Institute members self-assembling into teams in support of their highest priority project topic areas;
- The institute and its membership making joint decisions to move forward with the development of detailed plans for the highest priority projects

² “What is the National Network for Innovation?” <http://manufacturing.gov/nnmi.html> (accessed 2/23/2016)

Using this approach, project planning efforts all qualify as in-kind labor support to the institute and no single organization is responsible for the majority of the cost and effort to develop a proposal that may or may not ultimately be awarded in a competitive selection process.

Allow Project Teams to Self-Assemble Around Topic Areas in Which They Have the Most Interest

Self-organizing teams should be encouraged since members will gravitate toward the topic areas and projects that most closely align with their priorities. Therefore, we strongly discourage institutes from unilaterally assigning institute members to projects. Since members generally cover the costs of their own in-kind support to an institute project, they need the freedom to decide how they allocate this support. Fortunately, the institutes are well positioned to facilitate collaboration and relationship building across the entire membership. This is a valuable benefit for members at all levels.

Section 3: Intellectual Property (IP)

Establish an IP Council Comprised of Representatives from Government, Industry, and Academia to Collaboratively Define Mutually Acceptable IP Terms and Conditions for the Institute

In addition to the many aspects of launching a new institute, each new institute also has the challenge of negotiating a membership agreement with a vast list of pre-committed prospective members. One of the most significant factors contributing to the delayed launch of current NNMI institutes relates to defining terms and conditions that are acceptable to all prospective institute members, with IP terms historically being the biggest area of contention. Prospective institute members from government, industry, and academia all typically have different priorities with respect to IP management, but still need to agree to a mutually acceptable set of terms and conditions. In the past, a first draft of IP terms and conditions was often created unilaterally by either the institute or a forward leaning prospective member organization. This unfortunately led to a very drawn out negotiation and revision process involving many different parties, and ultimately significantly delayed the launch of many of the first seven institutes within the NNMI. To minimize this delay, future institutes should consider creating an IP Council primarily comprised of industry representatives from various types of member organizations, and also including some government and academia representatives, to collaboratively develop a mutually acceptable IP management plan for the institute which prioritizes safeguarding manufacturers' rights to use the IP to commercialize products. The creation of a member-driven model IP agreement for use by new institutes as a template when they establish their organization would likely reduce the time required to finalize the institute's structure.

Upon Termination of Institute Membership, Allow Member Organizations to Retain Rights to IP Generated During Their Period of Active Membership

An essential element of the business case supporting NNMI institute membership relates to access to IP and project results. Some institutes have explored implementing a clause in the membership agreement that immediately suspends access and rights to all institute project results and IP upon termination of institute membership. Although the motivation behind this clause

may be to incentivize continued institute membership for existing members, prospective member organizations typically view this as a “deal breaker” since it reduces the long-term value proposition of institute membership. When an institute member contributes resources to an institute project, they typically have the very reasonable expectation that they will retain access to all project data and IP that they invested in, and to which they rightfully obtained access to, from the duration of their membership.

Grant IP Rights Commensurate with Membership Tier and Level of Investment

A well accepted consortium practice is that background, solely-developed IP (i.e., IP developed outside the consortium) is solely owned, and jointly-developed IP (i.e., IP developed within the consortium) is jointly owned. A non-exclusive royalty free (NERF) license is granted to use consortium developed IP both internally and externally, but typically no sublicense rights are granted. Given the variability that exists between institutes within the NNMI, some variation in IP management plans between institutes is reasonable. However, institute members expect access to institute-created IP to be commensurate with their respective level of investment and membership tier. A current consortium best practice is to grant a perpetual, worldwide, NERF license for all institute-developed IP and project results to all top tier institute members, with lower tier members being granted a similar license to institute-developed IP and project results for only those projects they directly support.

Safeguard IP Development by Ensuring Internet Security and Stability

The NNMI’s overarching goal to accelerate breakthrough technological advances in the U.S. and commercialize those advances to benefit the nation’s manufacturing base can be achieved only if those development processes are secure from theft. Security of Internet communications from NNMI to members as well as among institute members need to be safeguarded to prevent IP theft. Security of internet communications should be a top priority as communications and data networks are developed among institute members.

Ensure a Framework Exists within the Institute to Perform Research That May be Restricted by United States Export Control Laws (ITAR & EAR)

Research on the leading edge of technology will inevitably involve capabilities that are occasionally regulated by U.S. export control laws. To ensure that institute research portfolios are focused on the capabilities with the most potential to enhance U.S. competitiveness, there must be an established framework within each institute to perform research subject to U.S. export control laws. This is particularly important for institute members from academia and industry who may not be familiar with U.S. export control laws. Failure to include this framework may significantly reduce the participation of large aerospace and defense companies in future NNMI institutes, and will limit the impact of institute research on U.S. manufacturing competitiveness.

Section 4: Network Sustainability

Provide Adequate Federal Funding to Accomplish Meaningful Results

Maturing new technologies and bringing them across the “valley of death” requires substantial resources, and a critical mass of funding is necessary to be able to perform meaningful work. Initial institute seed funding on the order of \$70M to \$100M seems adequate when combined with efficient, industry-focused and well-executed usage. An amount less than \$50M is likely insufficient to attract the highest quality proposers and a sufficiently large membership base required for long-term institute sustainment and mission success.

Define Future Institute Topics Based on National Need

When defining topics for a future institutes, consider sectors that are not serviced today. AMP 2.0 provides an excellent framework to evaluate and prioritize technologies with the greatest potential benefit to U.S. national security and long term economic growth.

Identify Additional Government Funding Opportunities That Can Be Channeled Through the Institutes

The Air Force Research Lab (AFRL) has occasionally sponsored a “Directed Project Call” at one institute, a process where competitive bidding on the project is open to institute members only. This is an outstanding benefit of institute membership, and additional funding opportunities like this can play a significant role in the long-term sustainment of the institute. By choosing to fund projects through an NNMI institute, federal agencies can:

- Leverage the project execution framework already in place at the institute
- Ensure the opportunity is communicated with the true thought leaders in the field
- Encourage collaboration between large industry, small and medium size enterprises, and academia that otherwise might not occur
- Increase the project scope that may be executed through 1:1 cost matching by institute members

This approach benefits all parties (the federal agency, NNMI institute, and institute member organizations), and can play a significant factor in the long-term sustainment of the institute.

Require a Cash Membership Fee to Support Long-Term Institute Operations

In an effort to grow membership ranks, some of the current NNMI institutes allow all, or a portion of, the required annual membership fee to be satisfied with in-kind contributions to the institute. To ensure sustainment, institutes will require cash to cover operating expenses and it is reasonable to require every member to pay a nominal cash membership fee every year, which could be scaled based on factors such as membership tier and organization size.

Institutes Should Not Rely on IP Revenue for Long-Term Sustainment

To date, multiple institutes within the NNMI have explored the use of IP-related revenue in support of long-term institute sustainment. However, in each case, prospective member organizations have convinced the institute not to take this approach since it significantly diminishes the value proposition of institute membership. IP terms and conditions should

support the primary NNMI objective to accelerate the commercialization of new technology. This recommendation reaffirms the similar recommendation made in “Guidance on Intellectual Property Rights for the National Network for Manufacturing Innovation”, published by the Advanced Manufacturing Program Office in October 2014.³

Maintain Affordable Membership Levels to Sustain Membership Numbers

As the number of NNMI institutes continues to grow, it will become increasingly difficult for organizations to maintain top tier memberships at multiple institutes simply due to funding constraints. To ensure maximum membership levels in future institutes, we recommend capping the annual financial commitment associated with top tier membership at \$500k (annual membership fee plus required in-kind support) or less. Other tiers of membership can become difficult to maintain as well, as the number of institutes increases. It should be anticipated that the number of members per institute may decline as more institutes are created. This calls for careful prioritization by all engaged parties. Identifying a mechanism to provide a “discount” for organizations participating in multiple institutes should be considered to encourage broad network participation.

Promote NNMI Cross-Network Collaboration on Workforce Development

Individual institutes are well positioned to define specific courseware and curricula that most closely align with the topic areas of their respective institutes. However, advanced manufacturing workforce development presents challenges that span all technical disciplines and that cannot be adequately addressed by a single NNMI institute. A Network-wide collaborative initiative is needed to define fundamental advanced manufacturing workforce development goals for the NNMI and to establish a framework that can be used by each institute to ensure alignment with industry needs. Close collaboration between centers and academia (community colleges and universities) will be critical in establishing this alignment.

Standardize the Institute Engagement Model across the NNMI

Significant variability exists across the current institutes in all aspects of business practices and operations. In addition to complicating memberships at multiple institutes, this variability also makes it difficult to assess the value proposition of membership at each institute. Establishing some amount of commonality in areas that include membership benefits, the membership agreement, IP rights, project calls, project management and oversight, and guidelines for acceptable in-kind contributions will provide much needed clarity to prospective institute members. This also will have the added benefit of strengthening the NNMI brand by establishing a consistent set of expectations for organizations when they engage with NNMI institutes.

As a quick reference, Appendix A provides a short summary of best practice recommendations contained in this white paper.

³ “Guidance on Intellectual Property Rights for the National Network for Manufacturing Innovation”, edited by Michael F. Molnar, Director, Advanced Manufacturing National Program Office, October 2014. http://www.manufacturing.gov/files/2015/12/nnmi_ip.pdf

Appendix A: Summary of NNMI Best Practice Recommendations

Section	Best Practice
1: Institute Organization and Operations	At Each Center, Establish a Member-Driven Committee Structure to Guide Decision Making
	Allow Institute Members to Contract Directly With the Institute Rather than Requiring Subcontracting With Each Other on Projects
	Streamline In-Kind Reporting
	Make Matching Project Funding Available to All Institute Project Participants
	Promote Awareness-Building Communications
	Maintain Significant Differentiation in Membership Levels and Benefits
2: Research Portfolio Definition	Require at Least Two Industry Sponsors for All Funded Research Projects to Ensure Industry-Relevance
	Develop Institute-Level Technology Roadmaps to Maintain Alignment Between Industry Needs, Academic Research and Institute Projects
	Require All Institute Funded Projects to Include a Well-Defined Transition Plan to Ensure Capabilities are Commercialized
	Avoid Traditional Competitive Project Calls that Require Significant Proposal Development Costs that Do Not Qualify as In-Kind Institute Support
	Allow Project Teams to Self-Assemble Around Topic Areas in Which They Have the Most Interest

3: Intellectual Property (IP)	Establish an IP Council Comprised of Representatives from Government, Industry, and Academia to Collaboratively Define Mutually Acceptable IP Terms and Conditions for the Institute
	Upon Termination of Institute Membership, Allow Member Organizations to Retain Rights to IP Generated During Their Period of Active Membership
	Grant IP Rights Commensurate with Membership Tier and Level of Investment
	Safeguard IP Development by Ensuring Internet Security and Stability
	Ensure a Framework Exists within the Institute to Perform Research That May be Restricted by United States Export Control Laws (ITAR & EAR)
4: Network Sustainability	Provide Adequate Federal Funding to Accomplish Meaningful Results
	Define Future Institute Topics Based on National Need
	Identify Additional Government Funding Opportunities That Can Be Channeled Through the Institutes
	Require a Cash Membership Fee to Support Long-Term Institute Operations
	Institutes Should Not Rely on IP Revenue for Long-Term Sustainment
	Maintain Affordable Membership Levels to Sustain Membership Numbers
	Promote NNMI Cross-Network Collaboration on Workforce Development
Standardize the Institute Engagement Model across the NNMI	

Table 1: List of Best Practice Recommendations by Section