The Advanced Manufacturing Jobs and Innovation Accelerator Challenge (AMJIAC)

MID-PROJECT REVIEW

U.S. Small Business Administration

MEP • MANUFACTURING EXTENSION PARTNERSHIP

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Introduction

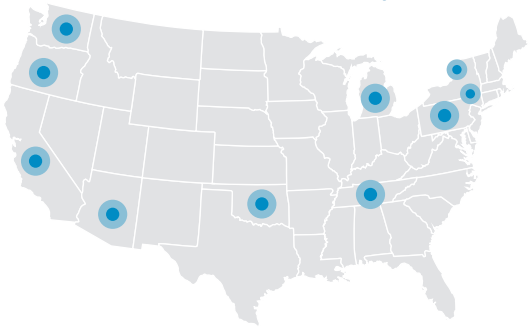
In recent years, Federal economic development policy has embraced the idea of fostering "industry clusters" as a mechanism for driving regional economic growth. Industry clusters represent dense formal and informal networks of companies, a supportive ecosystem for innovation, and deep pools of specialized and skilled workers. Through a series of challenge grant programs—the Jobs and Innovation Accelerator Challenge grants—the Obama Administration has invested in numerous regional efforts to strengthen and grow regionally-based industry clusters. The challenge grants leverage funding and technical assistance from multiple Federal agencies in a coordinated regional effort to generate greater impact than any individual agency might be able to achieve through their respective individual grant programs.

The first of these competitive Federal grant awards (the Jobs and Innovation Challenge) involved three agencies provided funding to twenty regions in 2010. In 2011, a slightly different group of funders awarded grants to 13 rural regions (the Rural Jobs and Innovation Challenge). In the third round, five agencies (including the NIST Manufacturing Extension Partnership) came together in an effort to support advanced manufacturing. In the Advanced Manufacturing Jobs and Innovation Accelerator Challenge (AMJIAC), NIST provided resources directly to MEP centers. In prior rounds, MEP contributed technical assistance to many grantees, but the AMJIAC grants received NIST MEP funding for the first time. Four other agencies joined NIST MEP to support advanced manufacturing clusters through the AMJIAC. Those agencies included the Department of Commerce's Economic Development Administration (EDA), the Small Business Administration (SBA), the Department of Energy (DoE), and the Department of Labor's Employment and Training Administration (ETA).

The AMJIAC call for proposals was announced in May 2012. After a competitive grant process, ten regions were selected located in Arizona, California, Michigan, New York, Oklahoma, Pennsylvania, Tennessee, Washington, and Oregon[1]. These grants support the creation and strengthening of regional partnerships capable of accelerating innovation and growing a region's capacity for advanced manufacturing. This funding has been used for activities such as worker training programs or connecting manufacturers to resources like national labs or universities. Ultimately, these grants present regions with an opportunity not only to expand their current activities, but also to fundamentally transform the way that the region supports its manufacturers.

The AMJIAC regions are now roughly halfway through their three year awards. The foundation for each initiative has been put into place, and implementation has begun. This document reviews some of the ways that NIST MEP participated in the AMJIAC projects. It begins with a brief overview of the AMJIAC goals for the integrated regional project, as well as the goals for the MEP specific projects. It then reviews early project accomplishments, and considers what MEP centers have gained through their participation in these regional initiatives.

10 Public Private Partnerships



[1] The complete list of projects can be found in the Appendix.

1.0
AMJIAC Partnerships, Goals and Activities

Although the AMJIAC grants have a complex structure, they do allow flexibility for regions to determine the best way to grow their target clusters and support Small and Medium-sized Manufacturers (SMMs). Table 1 demonstrates this flexibility by showing that the number and type of different AMJIAC partners varies greatly from region to region. In some instances, one or two organizations are taking the primary leadership role for the project. This is the case for the Delaware Valley (Pennsylvania) AMJIAC led by the Delaware Valley Industrial Resource Center (DVIRC) and the Southern Arizona AMJIAC led by the Arizona Commerce Authority (ACA)[2]. In these two cases, the MEP managers have taken on the primary management roles for the overall project. In several other regions such as Rochester (NY) and Oklahoma, the MEP center partnered with one other organization to lead different project elements. While many different types of organizations are leading the different projects, the NIST MEP projects are all led by the region's MEP center.

Figure 1: AMJIAC Project Leads

AMJIAC Regions	NIST Manufacturing Extension Partnership	Employment and Training Administration	Department of Energy	Small Business Administration	Economic Development Administration
Southern Arizona	N/A	Arizona Commerce Authority	Arizona Commerce Authority	Arizona Commerce Authority	Arizona Commerce Authority
Northern California	The Corporation for Manufacturing Excellence (MANEX)	Laney College	University of California Berkeley	Norcal Small Business Development Center(s)	Workforce Development Board of Contra Costa County
Southeast Michigan	Michigan Manufacturing Technology Center (MMTC)	Workforce Intelligence Network for Southeast Michigan	National Center for Manufacturing Sciences	Detroit Regional Chamber	Detroit Regional Chamber
Rochester, New York	High Tech Rochester	University of Rochester	University of Rochester	High Tech Rochester	University of Rochester
Syracuse, New York	CNY Technology Development Organizations	SUNY College of Environmental Science and Forestry	Syracuse University College of Engineering and Computer Science	Onondaga Community College	Syracuse University College of Engineering and Computer Science
Oklahoma	Oklahoma Manufacturing Alliance	Oklahoma State University	Oklahoma State University	Oklahoma State University	Oklahoma State University
Southwest Pennsylvania	Catalyst Connection	Wesmoreland-Fayette Workforce Investment Board	National Center for Defense Manufacturing and Machining	Innovation Works	Innovation Works
Delaware Valley, Pennsylvania	Delaware Valley Industrial Resource Center	Delaware Valley Industrial Resource Center	Delaware Valley Industrial Resource Center	Delaware Valley Industrial Resource Center	Delaware Valley Industrial Resource Center
East Tennessee	University of Tennessee Center for Industrial Services	Pellissippi State Community College	Technology 2020	Technology 2020	Technology 2020
Washington-Oregon	Impact Washington; Oregon MEP	Southwest Washington Workforce Development Council	Columbia River Economic Development Council	Oregon Microenterprise Network	Columbia River Economic Development Council

[2] The Southern Arizona AMJIAC lacks an MEP component because at the time of the application, Arizona had no MEP center.

By contrast, other regions have created a more broad-based set of partnerships, with different organizations leading one or two different grant elements. As seen in Table 1, this is particularly true for the Pacific Northwest where there is not only a different project lead for each element, but the NIST MEP project involves collaboration between two different MEP centers (Impact Washington and the Oregon MEP). These broader partnerships have the benefit of bringing a potentially more diverse set of networks, capabilities and resources to the AMJIAC projects. However, they also may present greater challenges in reporting and coordination, particularly if the partners do not have longstanding relationships or much experience with working together.

Overall Project Goals (all agencies)

The underlying objective for the AMJIAC awards is to grow a region's capacity to support and grow advanced manufacturing. However, each region draws upon unique assets and capabilities, so regions have chosen their own avenues for achieving this objective. Each AMJIAC region's overall project goals reflect this variety of approaches. Table 2 shows the overarching goals for each AMJIAC region. In most instances these projects are designed strengthen businesses in targeted industry clusters, while in others the regional partners are promoting greater use of emerging technologies. The AMJIAC awards therefore give regions the opportunity to engage relevant stakeholders such as universities, community colleges, economic development organizations, military, federal laboratories, workforce boards, and leading manufacturers. This funding helps focus partners around activities designed to expand their region's ability to train workers, promote new technologies, and expand markets.

Southern Arizona's AMJIAC project is one of the projects focused on strengthening a specific industry cluster. In this instance, the AMJIAC partners are attempting to position the region's aerospace and defense (A & D) cluster

Figure 2: AMJIAC Project Focus

Region	Focus of overall AMJIAC project
Southern Arizona	Develop the 6-county region's Aerospace & Defense (A&D) Cluster.
Northern California	Build a stronger regional innovation ecosystem to support biomedical manufacturing in the San Francisco East Bay region.
Southeast Michigan	Promote new product manufacturing capability within existing Southeast Michigan contract manufacturers.
Rochester, New York	Accelerate the growth of small and medium-sized companies in the region's optics, photonics, and imaging cluster.
Syracuse, New York	Support small and medium-sized companies that manufacture thermal and environmental control systems.
Oklahoma	Increase the innovative capacity and profitability of small and medium-sized manufacturers (SMMs) in the oil and gas cluster; the focus is on SMMs in 44 low-income Oklahoma counties.
Southwest Pennsylvania	Leverage the region's strengths in metal manufacturing and electrical equipment solutions to support innovation in three regionally significant industries (energy, life sciences and advanced electronics).
Delaware Valley, Pennsylvania	Accelerate the ability of companies, particularly in the transportation equipment manufacturing industry, to identify and commercialize new product or service innovations.
East Tennessee	Build additive manufacturing capacity of the region's SMMs by connecting them to the region's many significant resources (e.g., Oak Ridge National Laboratory) and services.
Washington-Oregon	Promote growth in the region's advanced materials and metals industries through greater regional collaboration.

as a premiere location for these activities, particularly the development and production of Unmanned Aircraft Systems (UAS). Consequently, the AMJIAC projects build on the region's many unique assets such as military installations like Fort Huachuca, major research centers like the University of Arizona, and large OEMs like Raytheon. These projects also seek to address key A&D cluster gaps such as overconcentration of employment in the large defense contractors and uncertainty of future defense spending and to support exporting activity and the development of new products.

In the Greater Rochester region of New York State, the Rochester Regional Optics and Photonics cluster was historically led by large companies like Kodak, Xerox and Bausch and Lomb. While companies like Kodak have experienced decades of downsizing, the region's optics and photonics industry has persevered due, in no small part, to newer, smaller companies started by former employees of these larger companies. Through the AMJIAC, the Rochester region is implementing activities intended to help them develop new products, improve their production processes, train qualified workers, and increase their revenues. For instance, High Tech Rochester connected Sydor Optics to an ISO consultant with experience in the optics industry. This allowed Sydor Optics to get quickly started on completing their ISO certification, which they achieved 8 months later. The AMJIAC partners are working with other cluster companies to identify their needs and provide the requisite services including workshops and trainings. All of these activities are being done in a strategic and coordinated manner, all with the intended goal of accelerating the growth of the region's small and medium-sized optics, photonics and imaging companies.

Similar cluster development efforts are underway in other AMJIAC regions, such as:

- The Oklahoma AMJIAC efforts are intended to create opportunities in the oil and gas industry. Small and Medium-sized Manufacturers (SMMs) in 44 disadvantaged counties have received plant energy audits and assistance designing new equipment and new product prototypes through the AMJIAC grant.
- In Northern California, the AMJIAC partners are working to create a stronger innovation ecosystem for biomedical manufacturing in the East Bay. This is being done by providing companies with access to services such as value stream mapping, lean layout and marketing support.
- In Pennsylvania, DVIRC is working with three of the large transportation OEMs to identify their supply chain needs.

Several AMJIACs projects are focused more on expanding the use of specific technologies, than on growing a specific industry cluster. In East Tennessee, the AMJIAC efforts focus on expanding usage of additive manufacturing technologies by the region's small and medium-sized manufacturers. The AMJIAC partners are using several strategies to accomplish this objective. For instance, tours of Oak Ridge National Lab's Manufacturing Demonstration Facility can show SMMs the possibilities of these technologies. Similarly the partners are creating a mechanism for better connecting SMMs to the resources of ORNL. On the workforce side, Pellissippi State has created an additive manufacturing certification program to equip new and incumbent workers with the skills necessary to use these technologies in the production process.

Michigan's "InnoState" AMJIAC project is unique in that it seeks to promote new product manufacturing capability within their existing contract manufacturing firms. This is a collaborative effort among the Michigan Manufacturing Technology Center (MMTC), the National Center for Manufacturing Sciences (NCMS), the Detroit Regional Chamber Foundation, and the Workforce Intelligence Network. The work involves providing opportunities for these existing contract manufacturers to create new products. Working through the Pure Michigan Business Connect Site, the Michigan team provides marketing and other tools for outreach and branding, as well as preparing the manufacturers with lean operations in order to produce products of their own.

Southwest Pennsylvania has taken a similarly unique approach, as the AMJIAC partners are establishing an Agile Hardware Design Center that will help high –impact start-ups and young manufacturers (particularly in areas related to energy, life sciences, and advanced electro-mechanical industries) make better use of agile start-up principles. This effort also will connect these high potential firms to electromechanical engineering design expertise. Training opportunities are made available to technicians and product developers in metal manufacturing and electrical equipment trades, while companies can access strategic development services and other forms of technical assistance.

MEP Specific Activities

As noted above, each AMJIAC grant involves five separate but coordinated projects. MEP centers are responsible for leading one of these five projects, but often participate in the other projects and the overall project management activities. MEP-led activities include providing market intelligence, conducting company outreach, identifying company needs, connecting SMMs to services and OEMs, and delivering focused technical assistance.

Market Intelligence

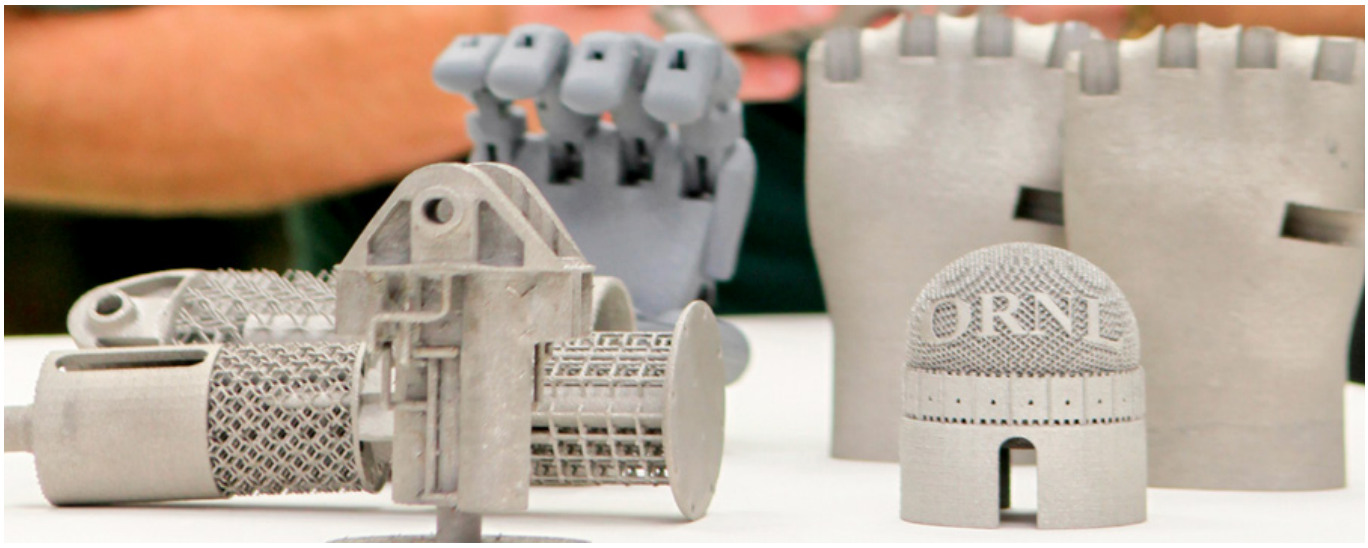
To enhance their AMJIAC efforts, several MEP centers have helped to lead or manage significant market research efforts. This research not only seeks to identify key cluster industry trends and challenges, but also helps to identify key companies and informs targeted outreach efforts. In a number of instances, MEP centers are contracting with third parties to help complete this research. For instance:

- In East Tennessee, the region's MEP center—the University of Tennessee Center for Industrial Services (UT-CIS)—contracted with the University of Tennessee's Center for Business and Economic Research (CBER) to analyze the region's manufacturing base and inform outreach efforts. The partners are then using their networks and the networks of local economic development organizations to engage companies and recruit their participation.
- In Southwest Pennsylvania, Catalyst Connection partnered with a third party to identify and evaluate the mega-trends most likely to impact the region's manufacturers over the next decade. This research will help develop a technology roadmap that will lay out strategies for manufacturers as they adopt advanced manufacturing technologies.
- In the Pacific Northwest, the AMJIAC partners engaged in research to examine potential export markers for machine shops and the pipe industry. The market intelligence gained from these studies will dictate the kinds of services the project offers cluster companies.
- In Southeast Pennsylvania, the AMJIAC partners conducted a market intelligence report for the transportation equipment industry. As in other regions, the trends identified in the report are enhancing the suite of services being delivered to cluster companies.

The focus of these studies can differ. In addition to shedding light on the issues affecting a particular cluster, through the process of conducting this research MEP centers can also identify new potential clients.

Company Outreach

MEP centers have also used the AMJIAC grants to conduct more targeted outreach activities. High Tech Rochester (HTR) has used that region's AMJIAC to support outreach to optics companies. Through those conversations, HTR now has a better understanding of the cluster's needs and as a result is better positioned to develop and deliver services to meet those specific needs. Similarly in East Tennessee,



UT-CIS and its AMJIAC partners work with employer groups and local economic development organizations to engage in extensive outreach through the region. Through these efforts the Tennessee partners can better communicate how the activities undertaken through the AMJIAC grant that can help their manufacturers.

Company tours are another key aspect of the AMJIAC outreach efforts. For instance, SMMs are invited to tour Oak Ridge National Lab's Manufacturing Demonstration Facility, where they are exposed to the variety of additive manufacturing technologies and their potential applications. While not all the firms who tour this facility will see direct applicability to their business, some of the companies see the potential for their own firms from the AMJIAC-related activities. Company tours have also been a key component of outreach activities in Syracuse's "TEC Tuesday" events. These events feature a cluster company in the Thermal and Environmental Controls (TEC) cluster, presenting their core competencies. They are held at one of the company's facilities so that others can tour their plant. It gives the companies opportunities for networking, supply chain integration of cluster member's capabilities, and shared technologies.

These outreach efforts are an important step in forming cluster networks elsewhere as well. For instance in East Tennessee the partners have created to Regional Advanced Manufacturing Partnership (RAMP), while in Oklahoma, outreach efforts have led to the formation of the Oil & Gas Industry Supply Chain and Marketing Cluster Manufacturing Council. Through the Michigan AMJIAC, MMTC is helping to organize SMMs looking to connect to larger original equipment manufacturers (OEMs) that want to strengthen their supplier base. These outreach activities and related cluster networks are enabling MEP centers to build a pipeline of potential clients and projects, those that may continue past AMJIAC's 3- year timeframe.

Impact Measurement

MEP centers are also actively involved in tracking performance measures for the AMJIAC activities. This is a typical area of strength for MEP centers, given their need to demonstrate measurable impact of their core center services with companies. Each MEP center takes the lead on collecting the basic information on the companies being serviced by the AMJIAC projects. They input this information into the MEP system, identifying the agency that provided assistance to the company. Six months after the clients have finished receiving assistance, an independent survey company contacts them and collects impact data. This is a unique contribution of MEP to the AMJIAC efforts.

2.0
Accomplishments to Date and Next Steps

As many of the AMJIAC projects are now up and running and beginning to gain momentum, the participating regions are starting to achieve tangible accomplishments from these efforts. At the most basic level, the extensive outreach efforts have made many regional companies more aware of the support services available to them. At the same time, service providers, specifically MEP centers, now have a greater understanding of the issues and challenges facing these companies. This knowledge will help inform future service delivery. There has been extensive one-on-one outreach to companies, but some regions have used the AMJIAC funding to support efforts to more efficiently reach a larger audience of companies. For instance, in Northern California the AMJIAC partners organized a Biomedical Manufacturing Summit that was attended by 138 people. Efforts are underway to grow this event in the future. This outreach has led to inroads into biomedical clusters and has provided benefits to the region's MEP center—Manex Consulting—as it estimates that 10 to 20 percent of its client calls will be dedicated to these cluster companies even beyond the grant period.

These outreach efforts are also beginning to translate into actual assistance to individual companies. By way of illustration, Eagle Bend Manufacturing is an East Tennessee hot stamp production facility that was under pressure to reduce the costs of laser cutting martensite material (a hard form of steel), while simultaneously meeting the dimensional and structural elements of the Federal Motor Vehicle Safety Standards crash test requirements. Eagle Bend Manufacturing engaged the East Tennessee AMP! (the AMJIAC group) to access the experts and resources at Oak Ridge National Laboratory (ORNL). Eagle Bend Manufacturing worked with ORNL to help them complete testing and analysis of a new hot stamping process. Through the involvement of the AMP! partners and ORNL, testing that normally would take months to complete, was performed within weeks. The ORNL analysis confirmed that the cost-saving hot stamping process improvement would meet the desired structural requirements. ORNL supported Eagle Bend Manufacturing in presenting this information to customers, gaining customer confidence and commercial and technical approval, and ensuring that the company's multi-million dollar contract to produce parts would continue. The decision to partner with AMP! and ORNL expedited this process advantage to the marketplace and positions Eagle Bend Manufacturing's East Tennessee plant as a leader among its competitors worldwide.

The AMJIAC grants have not only facilitated individual company engagements, but they have also allowed regions to pursue ambitious multi-company efforts as well. This was demonstrated in Central New York, where the AMJIAC partners organized several thermal and environmental control companies (SBB, Precision Machine Inc., SelfLock Screw and Higbee Gasket Company) around an effort to improve supply chain integration. The SBB leadership team prefers to source a number of components locally in order to reduce supplier lead times and increase customer satisfaction through meeting promised delivery dates. Due in part to the region's MEP center—the Central New York Technology Development Organization (CNY TDO)—SBB was able to identify local suppliers and ultimately selected SelfLock Screw through a competitive process. This supplier relationship will allow SBB to maintain and increase their local supply chain integration and reduce lead time reduction through partnering up companies with resources for shared benefits and capabilities. This local networking strategy not only reduced lead times, but also helped generate additional revenue. SBB also was looking to reduce the cycle time and ease the installation process for a clean room gasket system. By connecting SBB and Higbee Gasket Company, they worked together to develop a new material that can lead to reduced costs and installation times.

These kinds of stories are likely to become more common as the AMJIAC partners establish industry groups to facilitate efforts like the East Tennessee's Regional Advanced Manufacturing Partnership or Michigan's Innostate partnership. Looking ahead to the completion of the AMJIAC, the regions will continue their ongoing outreach. However, this outreach is not just about reaching a greater number of companies. In Michigan, for example, a number of the companies referred by partners did not match the cluster profile. As a result, the AMJIAC partners are working to ensure that they are engaging the right companies; namely those that closely fit the cluster profile and are most likely to benefit from the Innostate efforts. In other regions or project elements, company engagement may instead focus on finding a diversity of companies in terms of size or whether they meet the need for inclusion of women, minority or veteran-owned companies.

The sustainability of these efforts is also an important consideration because the AMJIAC awards are not intended to temporarily increase the existing capacity of the partners, but rather to make changes to how regions deliver manufacturing support services. As a result, some sustainability efforts might make use of memoranda of understanding between partners, or the pursuit of additional external funding to support these activities after the grant. Several regions such as East Tennessee are creating 501c3 organizations that will help support and facilitate these efforts in the future. The Northern California AMJIAC is also exploring a similar path. At minimum, regions should be looking to find longer-term homes for their programs. A bio-manufacturing internship program was created as part of the Northern California AMJIAC, and those partners are now looking to embed that internship program at the UC-Berkeley Career Center.

Regions that initiated pilot projects should also be considering what worked or did not work, and perhaps what might be needed to bring these projects to scale. Growing these pilot projects may often involve resources, but additional resources are not always the primary input. For the aforementioned industry groups established in East Tennessee or Michigan, this long-term sustainability does not necessarily require an extensive fee structure but they do require commitment. Most notably, they need to shift leadership of these groups away from the AMJIAC partners and more toward private sector leaders. It is expected that this private sector participation will emerge if manufacturers deem these activities beneficial to their companies and their supply chain.

Additional sustainability considerations may include developing a regional capacity for ongoing market research so that strategies are being developed with the most current information. Similarly, regions might consider strengthening their tracking system for evaluation because being able to demonstrate impact and outcomes are vital for securing additional funding. Also continuously creating new collaborations and partnerships—for instance between university researchers and companies—will yield tangible benefits to a number of companies over the medium and long-term. Similarly, many of the training programs that have been established through ETA-funded elements of the AMJIAC have resulted in opportunities for workers and benefits to manufacturers and should be continued.

3.0
AMJIAC Benefits to MEP Centers

AMJIAC funding facilitated MEP center participation in these regional initiatives, but these efforts also require significant time commitments to projects that are often outside of core MEP center activities. Centers participating in the AMJIAC projects have received tangible benefits from engaging in this kind of regional initiative. As described below, these regional initiatives often lead to new partnerships as well as better access to new funding and resources. These efforts can also improve access to potential client companies by increasing the center's exposure within the region. Centers are able to use the associated resources to pilot new programs or services that they may choose to offer companies in the future.

New Partnerships with Stakeholder Groups and Service Providers

The structure of the AMJIAC grants necessitates that MEP centers work with a wide array of organizations. The AMJIAC grants have also enabled participating MEP centers to strengthen existing partnerships and build new ones. These partnerships can result in many tangible benefits. For some existing partnerships, the AMJIAC grants provide the resources necessary to enhance existing collaborative work. This is the case in Oklahoma where the state's MEP center—Oklahoma Manufacturing Alliance (OMA)—built on an existing grant, awarded by NIST MEP that included the Oklahoma State University's New Products Development Center (NPDC) which is another AMJIAC partner. The primary focus of the effort from OMA is to enhance its partnership with Oklahoma State University's NPDC by strengthening deployment of technology acceleration and sustainability strategies, products, and services among Oklahoma manufacturers and launching new product development initiatives while providing design engineering support. The program has fostered the development of a strong relationship between OMA and Oklahoma State University, which has served both groups well in the present and the future. For instance, this relationship enabled the OMA to redesign the NPDC at OSU, so that it is now staffed with three design engineers and a full time director who are helping to successfully implement the AMJIAC project. The NPDC received the AMJIAC award from NIST MEP, with the OMA as the sub-recipient, and this allows them to continue serving to oil and gas industry supply chain companies.

These new relationships have the potential to lead to additional project work. Through their AMJIAC, Impact Washington, the State's MEP Center, developed a relationship with the Pacific Northwest Defense Coalition (PNDC). The PNDC currently is working with Impact Washington on a lean project. In addition the Southwest Washington Workforce Development Council (funded by ETA) used some of their AMJIAC funds, to prepare a consortium of AMJIAC companies for ISO certification, including providing training for staff. Upon completing the training, the companies that needed additional and individualized assistance are able to engage the MEP for further assistance with their ISO audits. Similarly, CNY TDO's regular meetings with the Syracuse University College of Engineering, State University of New York (SUNY) Environmental Science and Forestry, and Small Business Administration have strengthened the referral process among these key stakeholders. Through these strengthened relationships, potential projects are referred to CNY TDO on a more frequent basis. For example, a staff member from Syracuse University's College of Engineering attended a meeting at which the Director of Manufacturing Operations from an area manufacturer voiced concerns about work force development and staff training. The following day this staff member shared this concern with the rest of the group and the CNY TDO contacted the client soon afterward to discuss how the AM-TEC grant might be able to address the company's workforce development and training needs. The company was not only pleased with the speed of the response, but also that there are programs to help address their specific needs.

Beyond creating opportunities for new projects, MEP centers can leverage these partnerships to expand the range of services that they are able to offer client companies. The Southwest Pennsylvania's MEP center—Catalyst Connection—has established new relationships with two 3rd party consultants—113Industries and Achieve Global. 113Industries is helping Catalyst Connection with market research concerned with what manufacturers are doing relative to mega trends (sensors; additive manufacturing; cloud computing; "internet of things") impacting the electromechanical sector and how these mega trends will impact manufacturing over the next 10 years. This insight helps Catalyst Connection identify and develop new services.

Achieve Global is working with Catalyst Connection on developing capabilities in Professional Selling Skills that Catalyst Connection can then in turn offer to companies. Similarly, Impact Washington has contracted with TruNorth to assist and take companies further with strategic planning using the software, "CORE Values." Impact Washington uses this program for strategic growth assessment. This has led to at least one in depth technical assistance project with a senior company executive enabling Impact Washington to improve access to the C-level executives.

While these new and strengthened relationships have obvious benefits for the state and regional partners, there have been some instances where these partnerships have yielded potential benefits for the entire MEP system. The partnership between MMTC and the National Center for Manufacturing Sciences was created as a result of the Southeast Michigan AMJIAC grant. NCMS is the Department of Energy (DOE) funded partner in the Southeast Michigan AMJIAC project. When NCMS needed information on how to accelerate the penetration of computation-intensive software tools among US small- and medium-sized manufacturers (SMMs), they looked to MMTC to conduct the study (funded by Intel) because of their access to the region's SMMs. Subsequently, NCMS is now interested in possibly pursuing a wider partnership with NIST MEP in order to take this work nationwide. MMTC introduced NCMS to the nationally-recognized Center for Automotive Research (CAR), and CAR has subsequently engaged NCMS in work they are doing as part of a Make It In America (MIIA) grant, another multiagency initiative partially funded by NIST MEP.

Leveraged Resources

The partnerships established through the AMJIAC grants have also allowed the participating MEP centers to leverage additional funding and resources. For instance, under the auspices of the Southeast Michigan AMJIAC, MMTC conducted a study on the digital manufacturing needs and challenges faced by small and medium-sized manufacturers. The study results informed the direction of the AMJIAC-related activities, but the study itself was funded by Intel, and they would not have done so if not for AMJIAC grant. In another instance, MMTC was invited to participate in a MIIA grant in part because of the partnerships and relationships formed through the AMJIAC.

The multiagency approach has allowed MEP centers to connect small companies to other useful programs like SBA Boot Camps. These Boot Camp events are often one-day seminars that help entrepreneurs with the basics of starting and managing a business. While focused on supporting entrepreneurs and introducing them to important resources, they often target specific types of entrepreneurs, including veterans or technology-based start-up enterprises. These events not only help small companies, but they also provide a venue to introduce MEP centers to small and emerging companies. In East Tennessee the SBA Bootcamp, which was funded through the SBA contribution to the AMJIAC, generated at least eight projects for UT-CIS.

Workforce is another area where the multiagency approach utilized in the AMJIAC efforts can lead to additional benefits for MEP centers and companies. For instance, through the East Tennessee AMJIAC project, Pellissippi State is creating opportunities where teams of students help firms solve "real-world" problems using additive manufacturing technologies. By connecting companies to Pellissippi State, the AMJIAC effort not only helps the school and its students, but it also helps small and medium-sized manufacturers overcome real product and process development problems.

Increased Exposure and Awareness of MEP value-added

The AMJIAC grants have also helped to raise the profile of MEP centers in both the stakeholder and business community. Through AMJIAC-related interaction, partner organizations are now more aware of the range of MEP services and the value of what MEP centers can bring to these kinds of regional initiatives. In the future this should lead not only to referrals, but just as importantly, these MEP centers are more likely to participate in future regional initiatives such as the Investing in Manufacturing Communities Partnership (IMCP) proposals.

Another important benefit is how the AMJIAC grants have given MEP centers better access to client companies. Through the grant activities, MEP centers have been given the opportunity to talk to new companies as well as to work with existing clients in new ways. In Oklahoma, the AMJIAC gives OMA the opportunity to conduct focused outreach to a number of oil and gas companies. With this emphasis on the oil and gas supply chain, OMA is able to engage more of

those companies that they were previously unable to reach. The same is true for Impact Washington and the Oregon MEP. These MEP centers have used their AMJIAC project as a focus for their outreach efforts, identifying 150 companies, 70 of which are eligible for MEP services and at least 35 are new to the MEP.

In Arizona there was no MEP center when the grant was awarded, so there is no MEP-specific scope of work. However, the AMJIAC efforts have benefited the subsequently established Arizona MEP. The AMJIAC-related outreach has helped inform many Arizona manufacturers about the new center and its services. Also, the exporting initiative funded with the EDA grant will make use of Exportech, which is an intensive exporting assistance program developed jointly by NIST MEP and the US Commercial Service's Export Assistance Centers (USEACs). For Arizona overall, the AMJIAC project has brought more attention to manufacturing, and by extension it has given greater exposure and momentum for the newly established MEP center.

As MEP centers engage more with both the service provider and business community, they have been able to gain greater exposure and raise their stature in the manufacturing landscape. Exposure to new companies through the AMJIAC grants has helped more companies better understand MEP's value. This has certainly been the case in the Greater Rochester (NY) region where the AMJIAC has allowed High Tech Rochester to build stronger relationships with companies in the region's optics cluster. Prior to the AMJIAC, few optics companies considered High Tech Rochester as a relevant resource. The AMJIAC really enabled High Tech Rochester to make connections with core companies of the region's optics community, giving HTR the opportunity to engage with many cluster companies that they had not had the opportunity to meet. In the past, HTR struggled to find obvious and tangible benefits that they could offer. Through the AMJIAC, however, HTR has been able to expose more companies to the wide range of services that HTR can either provide or arrange for them. They are also working with World Leaders, a sales training company, to deliver training programs specifically targeted to companies in the optics cluster. This is a benefit for participants, but it is also an opportunity for HTR to show the wide range of support programs it can deliver. Therefore, through these various AMJIAC-related activities, participating MEP centers have been able to better demonstrate the value of MEP services to their regions manufacturers.

Pilot Opportunities for New Products and Services

Another benefit of AMJIAC-style grant opportunities is that they allow organizations the opportunity to pilot-test new products or services. As part of their AMJIAC initiative, the CNY TDO has developed training for cluster companies that responds to their needs such as how to find highly skilled workers and how to implement lean practices into their processes. Similarly, Catalyst Connection brainstormed with its AMJIAC partners about new services that could be developed in support of their cluster companies. As a result of these efforts, Catalyst Connection now offers a new service line related to open innovation and sales training. In Rochester, HTR connected companies to Minoritech which is a distributor of supplies for optics companies. By establishing this joint purchasing arrangement, optics companies are able to combine their orders and receive large volume discounts.

The benefits of these pilot programs are many. They allow service providers to test the demand and gauge company interest in those new services. They also allow service providers to identify challenges and implement solutions before expanding the scale and scope of the program offerings. Grants like the AMJIAC provide an excellent opportunity for centers to experiment with new ideas and approaches because the resources do not affect the center's core funding.

4.0 Common Implementation Challenges

The AMJIAC investments provide an opportunity for regional leaders to collaborate in new ways, but these efforts are not without challenges along the way. The first key challenge relates to building a strong network designed to support the initiative. For each region, the partners often needed to create a new governance structure and develop a more intensive communications network to ensure that the five elements of each AMJIAC project are well coordinated. This is less a challenge for AMJIACs like Southern Arizona and the Delaware Valley where one organization oversees all project elements. But for other regions this can be more complicated, because a different organization oversees each of the project elements. Secondly, the reporting and oversight requirements of the five Federal funding agencies add complexity to managing the AMJIAC projects as the region may receive different levels of input and guidance from the various Federal agencies. Working through these issues helps ensure that the projects are accountable to their separate funders while also meeting broader regional goals. However, this can slow project progress and distract managers (especially in the early stages of the project) from the important work of achieving tangible, measurable impact. The AMJIAC regions are actively working through these challenges, and adopting solutions to address these issues.

The intricacies of managing a multiple-agency award, like the AMJIAC, become clear immediately upon project start-up. Once regions are awarded these grants, there are several implementation hurdles that must be overcome to move the effort forward. The stakeholders must more formally define roles and solidify agreements on their work plans. This can take time, particularly when the regional partners do not have a long history of working together and need to develop new relationships. This was the situation in Washington and Oregon, where it took many weeks for the five partners to lay out their specific roles and responsibilities. In contrast, regions where the partners have long standing relationships were more likely to move quickly from project planning to project implementation. This was the case in East Tennessee where the partners had worked together on a similar Jobs and Innovation Accelerator Challenge Grant related to composites. Since they had prior experience working together, establishing agreements and defining roles was relatively easy.

These pre-existing relationships also made it easier to establish the governance structure for managing and monitoring the East Tennessee AMJIAC. The East Tennessee partners created an implementation team for each of the five projects as well as a project advisory board. The implementation teams meet every other week, and the project advisory board meets once a month to oversee and coordinate the five projects. They also help set the regional vision and mission and ensure that the implementation activities are all moving toward achieving that regional vision. Similarly, in Southwest Pennsylvania, the five participating organizations meet monthly not only to review each project's progress, but also to discuss cluster company needs and what solutions or services they may be able deliver in order to address those needs. Catalyst Connection convenes these meetings and organizes the company support efforts.

Regions also may find that there are differences between what they proposed and what they are actually able to implement. These modifications may be necessary to incorporate new partners or to take advantage of emerging new opportunities. For instance, the East Tennessee project partners added a new effort designed to support the First Robotics competition. The First Robotics competition gave the East Tennessee AMJIAC an avenue for incorporating a K-12 element into their regional workforce elements. However, bringing new partners into the AMJIAC requires aligning expectations and coming to agreement about how these additional efforts can contribute to the overall project goals.

In Arizona, after being awarded the AMJIAC, the Arizona Commerce Authority reviewed what had been proposed and made some modifications to ensure successful implementation. Their goal is to make a difference rather than merely satisfy the grant requirements. For instance, rather than create an industry network of aerospace and defense companies as proposed, they are seeking to use the AMJIAC opportunity as a way to re-energize the state's existing Aerospace and Defense Commission. Similarly, ACA wants to leverage other projects to advance the AMJIAC effort. As a result, it delayed the start of the SBA portion of its AMJIAC project until it completes a database of smaller companies as part of a Department of Defense Office of Economic Adjustment (OEA) project. This OEA-funded database will be a significant resource and its ability to inform

the AMJIAC SBA project will allow that project to reach more companies and have greater impact.

The complexity of these grants can also presents communications challenges. The project organizers need to be able to effectively communicate its overall mission and individual components both internally among the participating organizations and externally to other stakeholders and the manufacturing community. For the participating organizations, effective communication is necessary for coordinating activities and ensuring that the partners know how the pieces fit together. To support these efforts NIST MEP designed an on-line internal tool for each AMJIAC group, called CONNECT. The CONNECT tool allows the AMJIAC partners to track company contact information, summarize company interactions, and create a database of partner groups. This has enabled them to easily share vital information unique to their project. The Central New York AMJIAC partners (focused on New York's Advanced Manufacturing of Thermal and Environmental Control Systems) uses this tool extensively in their work.

For interacting with groups external to the AMJIAC effort, it is important to communicate how the AMJIAC effort fits within the broader region and how it is not intended to replace or take over other initiatives. In Northern California, the AMJIAC partners held a Biomedical Manufacturing Summit intended to showcase the AMJIAC to local organizations and help organize future network meetings. This kind of clear communication is particularly important for dealing with critics or skeptics. The communications challenge is especially problematic for private sector partners that may care less about the grants and more about whether the project offers solutions to their primary problems. Therefore, it is important that the AMJIAC leaders are clear about their objectives, and how their efforts can help companies become better manufacturers.

Needless to say, this kind of intensive research and engagement process takes time, delaying implementation activities in some cases. Regions that have used research to target their outreach efforts are engaging companies that are more likely to benefit most from the AMJIAC programs. This is particularly true for the regions looking to work with companies that use a specific technology (e.g., additive manufacturing, advanced computing) rather than just companies that belong to a specific industry. These research and outreach activities are critical because they ensure that the regional partners are deliberative in their approach and increase the likelihood that the region's efforts will generate measurable impact.

Beyond slowing the AMJIAC project's launch, these grants can present other challenges as well. For instance, several regions noted that AMJIAC-style grants can pose important staffing challenges. As mentioned above some regions are using this opportunity to launch new initiatives or pilot new services. These efforts are often outside of their core responsibilities, so completing the grant activities necessitates that staff do more than just their core tasks. In order to balance AMJIAC work with core responsibilities, several regional groups used the AMJIAC funds to help manage projects. However, this approach does not build a strong basis for the project's long-term sustainability. Given the temporary nature of these grants, organizations may be reluctant to hire new personnel, but successful implementation may depend on it.

The projects are organized in complicated ways, with five different project plans and scopes of work for each AMJIAC award. The scopes have different yet overlapping contributors. Even though these projects are all working toward a common objective, the AMJIAC leaders must nevertheless report to five different federal agencies that all have different levels of knowledge, involvement, and expectation. The Integrated Work Plan Quarterly Report—which includes a summary of each agency's work for the quarter—addresses some of this challenge. However, there are also individual reports submitted to respective agencies and this is an ongoing burden. Some regions find some federal agencies slow to work with, and these delays can hinder their progress. This can diminish some of the benefits of multi-agency efforts. The AMJIAC projects are intended to break down the silos between the different areas, but this does not happen overnight and making these connections can take time.

The complexity of working through multiple agencies also plays out in the impact survey process. MEP centers are accustomed to surveying client companies to measure impact, but individual companies may be working with multiple AMJIAC partners on different projects. This creates some challenges for MEP centers in collecting their impact data because when companies complete the survey they may not make the distinction between their work with MEP and their work with the other AMJIAC partners. Moreover, MEP centers may be working with companies as part of their traditional MEP work as well as through the AMJIAC-related work. For the MEP center, this may be two separate projects each requiring a completed survey, but the company may perceive this as one project. As a result, MEP centers must sort through these issues to effectively get the accurate impact data that is required. Working through these initial challenges can take time, and delay regions in showing tangible and measureable impact from their AMJIAC initiatives.

5.0
Conclusion

The AMJIAC projects have helped these ten regions to raise the profile of advanced manufacturing within their economies. The resources attached to these projects have generated attention from service providers as well as spurred public and private sector leaders to focus more of their attention on the important contributions of the manufacturing sector. MEP centers play vital roles in this process and in these projects. For the MEP centers involved, the AMJIAC projects are helping to create new relationships, or strengthen existing relationships, with other key regional partners. As a result, these activities should provide longer-term benefits because they give the MEP centers access to other resources and expertise. Moreover the other AMJIAC partners are more aware of MEP capabilities and their value, and as a result this should increase referral opportunities. The AMJIAC projects have not only raised MEP's profile among service providers, but it has given MEP centers reasons and resources to do additional outreach to companies. Consequently, MEP centers in AMJIAC regions have been able to expand and strengthen their connections within their regional manufacturing community and this too should lead to long-term benefits in the form of more project work.

The AMJIAC projects have also allowed MEP centers to define their role in regional cluster strategies. Through these efforts, MEP centers have primarily been active in four kinds of activities—market intelligence, company outreach, technical assistance, and reporting and evaluation.

- Market Intelligence: For many of the AMJIAC projects, MEP centers have taken on a key role in leading or managing the AMJIAC project's vital market intelligence efforts. This process should be an ongoing (or at least regular) process. This information gathered through these efforts can help shape and guide manufacturing support services well into the future. Due to their unique knowledge of manufacturing and manufacturers, MEP centers are well positioned to gather, interpret and disseminate intelligence gained about the region's industrial economy.
- Company outreach: MEP centers have been particularly effective in this role because it draws upon the ability to communicate with manufacturers in a manner that they understand. Not all economic development organizations understand manufacturing in quite the same way, and as a result MEP centers are well positioned to understand manufacturing challenges and pain points and then connect firms to a service or resource that will help them overcome those challenges. In a sense, MEP centers play an important connector role between the manufacturing community and the service provider community.
- Technical assistance: MEP centers are not just connectors and brokers of support services. They have a well-established capacity for providing direct technical assistance to companies in areas such as lean, new markets, new products, growth, safety, export promotion and sustainable manufacturing. This capacity can make MEP centers vital contributors to a whole host of different cluster-related strategies.
- Reporting and evaluation: The ability to report and demonstrate impact of regional manufacturing strategies is not only important to guide future activities, but it is also crucial for securing additional resources and funding. This is a strength and area of expertise for MEP, and one that the AMJIACs have allowed the centers to introduce to their partners. The lessons from this experience are likely to impact future regional manufacturing initiatives.

As cluster efforts go forward in regions across the U.S., MEP centers can learn lessons from the AMJIACs about how to engage with new and existing partners. Not only do MEP centers have much to bring to future work to support manufacturing clusters, but they also have much to gain through their implementation and the resulting successes. These grants have allowed MEP centers to build capabilities that they can later apply to other current and future center activities. As the AMJIAC projects enter their final stretch, policy makers can expect these activities to gain additional traction and reach more companies. Moving forward, the regions will be looking for ways to grow and sustain many of these efforts beyond the grant period. Those successful initiatives will then serve as models for other regions looking to grow and strengthen their regional manufacturing sector.

APPENDIX 1: AMJIAC Rewards

Total funding awarded: $20M, List of Awardees:

1. Arizona: Growing the Southern Arizona Aerospace and Defense Region, a project of the Arizona Commerce Authority. ($1,817,000)
2. California: Advanced Manufacturing Medical/Biosciences Pipeline for Economic Development (AM2PED), a project of Contra Costa County, Manex, the University of California-Berkley, Laney College, and the Northern California Small Busine Development Center at Humboldt State University. ($2,190,779)
3. Michigan: Innovation Realization: Building and Supporting an Advanced Contract Manufacturing Cluster in Southeast Michigan, a project of the Southeast Michigan Community Alliance, the Michigan Manufacturing Technology Center, the National Center for Manufacturing Sciences, and Detroit Regional Chamber Foundation. ($2,191,962)
4. New York: A Proposal to Accelerate Innovations in Advanced Manufacturing of Thermal and Environmental Control Systems, a project of Syracuse University, NYSTAR, the State University of New York's College of Environmental Science ar Forestry, and Onondaga Community College. ($1,889,890)
5. New York: Rochester Regional Optics, Photonics, and Imaging Accelerator, a project of the University of Rochester, NYSTA and High Tech Rochester Inc. ($1,889,936)
6. Oklahoma: Manufacturing Improvement Program for the Oil and Gas Industry Supply Chain and Marketing Cluster, a project of the Oklahoma Manufacturing Alliance, the New Product Development Center at Oklahoma State University, th Oklahoma Department of Commerce, the Center for International Trade and Development at Oklahoma State University and the Oklahoma Application Engineer Program. ($1,941,999)
7. Pennsylvania: Agile Electro-Mechanical Product Accelerator, a project of Innovation Works, the Catalyst Connection, the National Center for Defense Manufacturing and Machining, and the Westmoreland/Fayette Workforce Investment Board. ($1,862,150)
8. Pennsylvania: Greater Philadelphia Advanced Manufacturing Innovation and Skills Accelerator, a project of the Delaware Valley Industrial Resource Center. ($1,892,000)
9. Tennessee: AMP! — the Advanced Manufacturing and Prototyping Center of East Tennessee, a project of Technology 202 the Tennessee Manufacturing Extension Partnership, Oak Ridge National Laboratory, Pellissippi State Community College and the University of Tennessee. ($2,391,778)
10. Washington and Oregon: Innovations in Advanced Materials and Metals, a project of the Columbia River Economic Development Council, Impact Washington, Southwest Washington Workforce Development Council, and the Oregon Microenterprise Network. ($1,792,221)

The Advanced Manufacturing Jobs and Innovation Accelerator Challenge is a competitive multi-agency award to support initiatives that strengthen advanced manufacturing in industry clusters. These consist of small and large businesses, universities, nonprofits and other local stakeholders that "cluster" in a particular area. The funds will further develop the clusters by supporting local efforts to spur job creation through a variety of projects, including initiatives that connect innovative small suppliers with large companies, link research with the start-ups that can commercialize new ideas, and train workers with skills that firms need to capitalize on business opportunities.

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