

Strategic Framework for Strengthening Advanced Manufacturing in the Quad Cities

Creating a Regional Innovation Hub to
Forge Partnerships, Commercialize Research,
Unleash Entrepreneurs, and Grow Businesses



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INITIATIVE BACKGROUND AND GOALS

Building on the Quad Cities' powerful industry strengths in advanced manufacturing to make the region a recognized global hub for the metal and multi-materials (M3) sector

The economic development leadership of the Quad Cities has identified “Advanced Manufacturing” as a key opportunity to cultivate innovation, create jobs, and drive economic growth in the region. The region has a number of vital economic assets and strengths that provide opportunities and competitive advantages in the advanced manufacturing sector. However, in order to effectively position the Quad Cities for growth in the advanced manufacturing sector and to leverage the region’s strengths, it is important to narrow the focus on specific industries and industry clusters within the context of advanced manufacturing where the Quad Cities is particularly strong.

The metal and multi-materials (M3) sector is a specific advanced manufacturing industry cluster that is very important to the Quad Cities regional economy and ripe for new innovation and growth. A number of economic development studies and analyses completed over the last several years recognized this strength and identified metal and/or materials as a key cluster for the region and target for growth. **The challenge now is what to do with this information.** How can the Quad Cities take the advanced manufacturing in the M3 sector to a higher level? How can the Quad Cities build on its powerful assets in this industry to become a globally-recognized hub for innovation in the metal and materials sector?

The primary purpose of this report is to delve into more detailed analysis of the specific opportunities within the M3 sector and to present a “Strategic Framework” for how the region can forge public/private and business-to-business partnerships to foster innovation, commercialization, job-creation, and entrepreneurship through advanced manufacturing in the metal and multi-materials sector. Specifically, this report is divided into the following sections:

- 1) **Why the M3 Cluster is Important to the Quad Cities Economy**
- 2) **Opportunities for Growth and Innovation in the M3 Cluster**
- 3) **Strategic Framework**
- 4) **Case Studies/Best Practices**
- 5) **Key Next Steps**

Past Studies Identified M3 as a Target for Innovation and Growth:

Advanced Manufacturing in the Metal and Multi-Materials Sector has been identified in numerous Quad Cities economic development studies and reports. The challenge now is implementing a strategy to leverage this strength and opportunity.

- **Quad Cities Regional Global Growth Initiative** (Vandewalle & Associates, 2010) – Identified the metal and multi-materials sector as a global economic opportunity for the region
- **Target Industry Analysis for Quad Cities First** (Ady Voltage, 2010) – Detailed industry analysis pointed to metals as a key target cluster
- **The Illinois Quad Cities Economic Development Action Plan** (Angelou Economics, 2005) – Identified “Industrial Machinery” including metalworking as target industry
- **The Bi-State Region Comprehensive Economic Development Strategy** (Bi-State, 2008) – Highlighted “Metal Heat Treating”, “Metal Coating”, and “Aluminum” as key industries

1) WHY THE M3 CLUSTER IS IMPORTANT TO THE QUAD CITIES ECONOMY

Advanced manufacturing in the metal and materials cluster is a large and vital sector of the Quad Cities economy... However, the region needs to work together, embrace innovation, discover new opportunities, and access new markets to keep this sector competitive.

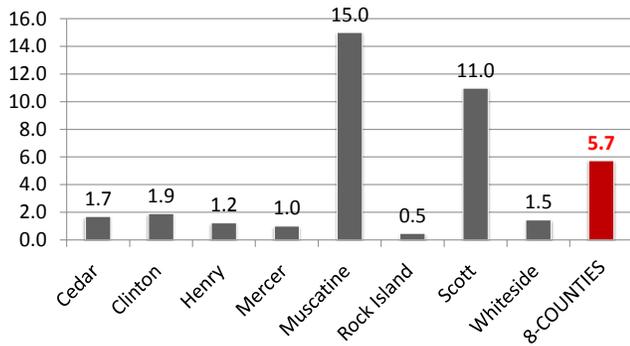
Before proposing strategies to advance the M3 cluster in the Quad Cities region, it is important to first examine its existing magnitude and importance to the regional economy. The following charts and analysis are based on employment data for four “sub-clusters” within the M3 sector (Primary Metal Manufacturing, Fabricated Metal Manufacturing, Advanced Materials, and Machinery Manufacturing). These four sub-clusters are drawn from the U.S. EDA’s “Rural Innovation Project”, which identified seventeen key industry clusters and a corresponding list of NAICS codes for each. The data presented compares total employment within these four sub-clusters for the Eight-County Quad Cities area that was delineated by the Global Growth Initiative work completed in 2010.

The following charts show location quotients for these four pre-defined clusters, as well as total employment in 2010 and change in employment from 2001 to 2010. Location quotients are a widely-used benchmark for evaluating a region’s competitive position in specific industries relative to the national economy. Specifically, location quotients calculate a region’s ratio of employment in an industry to total employment and compare that to the same ratio for the nation. A location quotient greater than one indicates that a region has a higher concentration of employment in that industry than what would be expected given the national average. Location quotients significantly greater than one indicate a competitive advantage in that sector. High location quotients suggest that the region has unique industry expertise in the sector and is likely exporting goods or services related to that sector.

Definition of Terms: Advanced Manufacturing and the M3 Industry Cluster

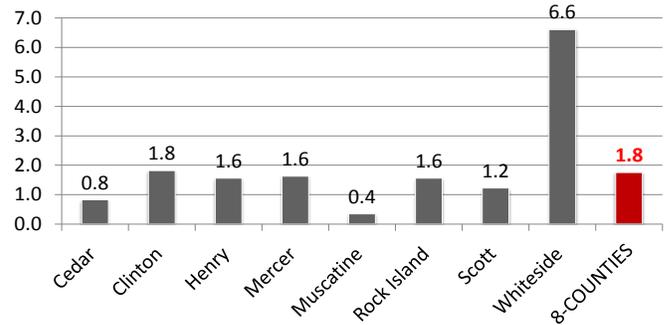
Broadly speaking, “Advanced Manufacturing” refers to the utilization of new technologies, processes, and materials to improve efficiency and performance in the production of goods and equipment. The metal and multi-materials (M3) sector is a large but specific industry cluster with numerous application opportunities for Advanced Manufacturing. M3 is an inclusive term that encompasses a wide array of industries related to the production and use of physical materials in manufacturing processes. This report posits that Advanced Manufacturing with an emphasis on the M3 sector is a ripe opportunity for innovation and economic growth in the Quad Cities.

Primary Metal



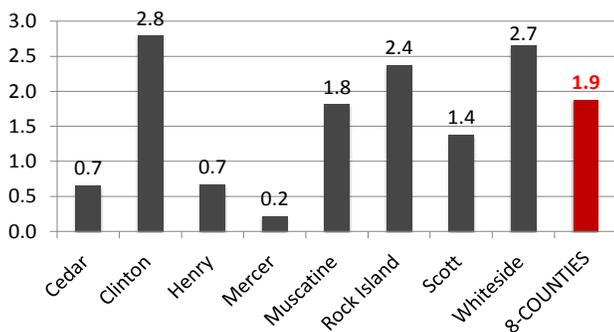
Cluster Definition: Industries related to the production of base metals (i.e. smelting, steel mills, foundries, etc.)
Total Employment in the 8-County Region: 3,913
Employment Growth/Decline (2001-2010): -1,412

Fabricated Metal



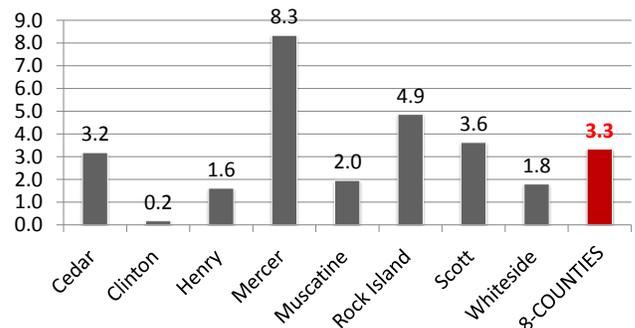
Cluster Definition: Metal processing and fabrication (forging, stamping, heat-treating, bolt & nut manufacturing, structural steel manufacturing)
Total Employment in the 8-County Region: 4,145
Employment Growth/Decline (2001-2010): -2,861

Advanced Materials



Cluster Definition: Processing and manufacturing in industries related to metals, ceramics, plastics, composites, glass and any other materials
Total Employment in the 8-County Region: 16,976
Employment Growth/Decline (2001-2010): -1,939

Machinery Manufacturing



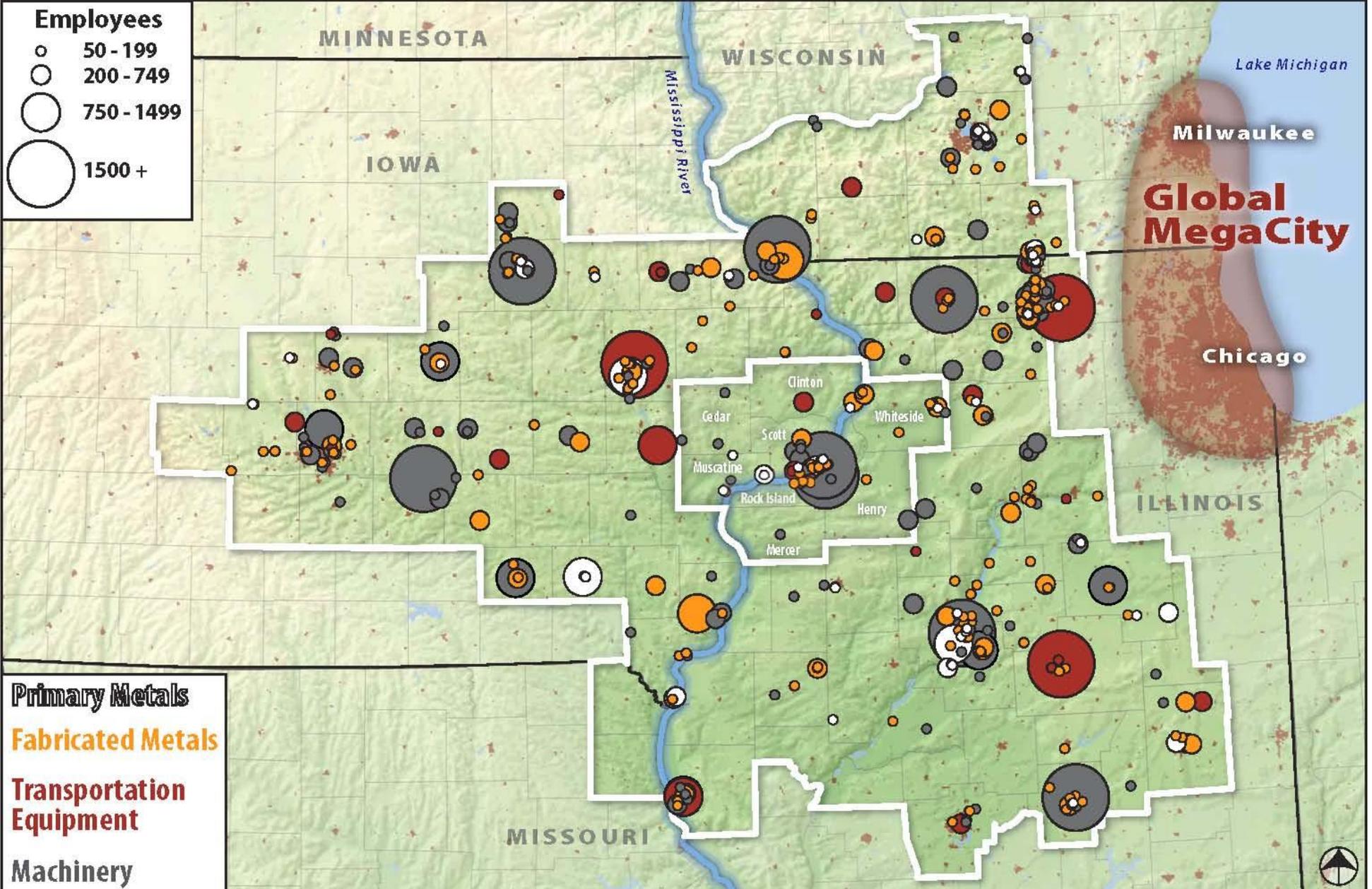
Cluster Definition: Farm machinery manufacturing, construction equipment, woodworking machinery, etc.
Total Employment in the 8-County Region: 8,315
Employment Growth/Decline (2001-2010): -932

KEY FINDINGS FROM DATA ANALYSIS:

The location quotient analysis of the four identified industry “sub-clusters” reveal four key findings:

- 1) **The Quad Cities area has strong competitive advantages across the M3 industries** – The 8-County area has location quotients significantly greater than one for all four of the identified sub-clusters within the M3 industry. This indicates that the region has strong clusters of industries in the sector, competitive advantages relative to other parts of the county, and a wide range of expertise across the breadth of the M3 sector, including both primary metal production as well as finished products.
- 2) **The M3 Industry is large and important** – The four identified subclusters all employ over 1,000 workers within the 8-county region (2010 data). This only includes direct employment within companies that fall within these sectors and does not include indirect jobs involved in serving these industries. The metal and materials sectors are clearly an important part of the Quad Cities economy.
- 3) **Different parts of the 8-County Region have different strengths in the M3 cluster** – The regional economy within the 8-County area is diverse and each county had different strengths within the M3 sector. This diversity in strengths highlights the value of connecting the M3 industries across the geography of the region and up and down the supply chain of the industry.
- 4) **Though large, these industries are shedding jobs** – All four of the identified sub-clusters have lost jobs in the Quad Cities over the last 10 years. These decreases in employment may be partially due to automation and other technologies that have simply increased efficiency of production per worker and may not necessarily be a sign of industry weakness. However, from an economic development perspective, these jobs losses in key manufacturing sectors are concerning and point to the need for strategic approaches to support innovation in these sectors to help bolster job creation in the future.

Manufacturing Clusters - Machinery, Transportation Equipment, & Metals



Source: ReferenceUSA; Vandewalle & Associates Inc.



2) OPPORTUNITIES FOR GROWTH AND INNOVATION IN THE M3 CLUSTER

The M3 Cluster is rich in opportunities for new technology development, new market penetration, efficiency gains, and increased global connectivity

The metal and materials sectors are well-established industries that have been key components of the Quad Cities economy for over a century. Despite the M3 sector's long history in the region, the metal and materials industries are ripe in opportunities for innovation and global growth for several key reasons:

- **Global economic growth in emerging markets** – Over the next several years and decades, growth and development in emerging economies around the world will allow millions of people to ascend into the global middleclass. As these millions around the globe rise from poverty, they will fuel a massive new demand for products, services, and infrastructure afforded by this lifestyle. As developing countries emerge from subsistence-based lifestyles to higher standards of living, one of the first things they demand will be the modern machines, buildings, and infrastructure that are the hallmarks of the developed world. This will drive a rapid and dramatic increase in global demand for metals, multi-materials, and the finished products made from metal and multi-material inputs.
- **Energy and raw material scarcity** – At a basic level, the primary inputs to metal production are minerals and energy. In primary metal manufacturing, minerals are mined from the earth and massive amounts of energy are then used in smelting, forging, and casting processes to transform these materials into usable metals. For plastics and composites, the primary raw material is most often petroleum. As the energy and mineral resources of the planet become more scarce, the potential demand for new technologies that can create metal and materials with alternative raw inputs and with less energy will increase.
- **Emerging technologies** – New technologies and industries are reshaping the global market for metal and multi-materials. The manner in which raw materials are harvested and transformed into finished products is changing. New markets and new industries for finished products are changing, as well. The nations, region, and companies that recognize these changes and position themselves to embrace new technologies will succeed while others fail. With the region's deep expertise, the Quad Cities has an opportunity to be "in-front" of a rapidly-changing metal and materials sector. However, establishing this position will require a bold and forward-thinking strategy.

Within the context of change and new opportunities, the Quad Cities has several specific niche opportunities to position the region as a global hub for innovation and commercialization. The region's unique areas of expertise and strengths create currently untapped potential for innovation, growth, and entrepreneurship. Based on discussions with key industry representatives, researchers, economic development leaders, and other stakeholders, the following five innovation targets were identified. The following matrix describes each of these opportunities.

**Quad Cities Metal & Multi-Materials (QC-M3) Strategy
Innovation Opportunity Matrix**

Innovation Opportunities	General Description	Why this is a growth opportunity for the QC-M3 Cluster	Potential innovation partners
Additive Manufacturing	Additive manufacturing is the process of producing metal objects by using precision 3D devices to build the object in layers	With the unique equipment and expertise available at the QCML, the Rock Island Arsenal, and local manufacturers, the Quad Cities region is a leader in additive manufacturing. Building on this to expand the region’s capacity in rapid prototyping and other applications of additive manufacturing technology could become an enormous opportunity to grow the regional economy and expand local industries.	<ul style="list-style-type: none"> • QCML • WIU
Adhesives	“Adhesives” refers to the numerous techniques used to bond metal objects to each other and to other materials (welding, riveting, etc.)	Finding stronger and less costly techniques for bonding metals and other materials is a key opportunity with the M3 sector. This includes new and better welding techniques, chemical processes, and mechanical bonds. New techniques and technologies are emerging within the metal and materials adhesives space and it is an innovation opportunity that directly relates to the Quad Cities economy. With the region’s blend of industry know-how that includes primary metal production, as well as machinery and equipment manufacturing and assembly, the Quad Cities is well-positioned for global leadership in adhesives.	<ul style="list-style-type: none"> • QCML • Alcoa • Arsenal • John Deere • WIU
Robotics / Information Technology	Robotics are becoming increasingly common in welding and other manufacturing applications. Related to this, more and more advanced Information Technology (IT) systems are needed to program and operate intelligent manufacturing operations	The Quad Cities has a large number of small and mid-sized companies with expertise in robotic welding. With this uncommon local skill set, the Quad Cities could expand its position in the robotics sector, as well as in other intelligent manufacturing systems technologies. According to local experts, the robotic welding companies in the Quad Cities are highly-skilled and could expand into other markets.	<ul style="list-style-type: none"> • QCML, • Local robotic welding companies • John Deere • IP Institute
Friction Stir Welding	Friction stir welding (FSW) is a specific bonding technology used to join metals without melting or otherwise altering their solid state	FSW is a technology with a wide range of potential applications, particularly in the aluminum sector. The Quad Cities is a national leader in aluminum manufacturing and the QCML has deep expertise in FSW. The Quad Cities region could expand its role in FSW technology.	<ul style="list-style-type: none"> • Alcoa • QCML • RIA
Coatings	Metal coatings are widely used to improve strength, durability, and other performance aspects of metals	Metal coatings and finishes are an area within the metal industry that is ripe for innovation. With the Quad Cities long history of producing metal parts exposed to high degrees of wear (i.e. agricultural equipment), the region has deep expertise in developing metal coatings to improve durability, reduce manufacturing costs, and reduce corrosiveness. Emerging innovations in conductive polymer coatings, and other coating and finishing technologies create opportunities for the Quad Cities.	<ul style="list-style-type: none"> • IP Institute • QCML • John Deere

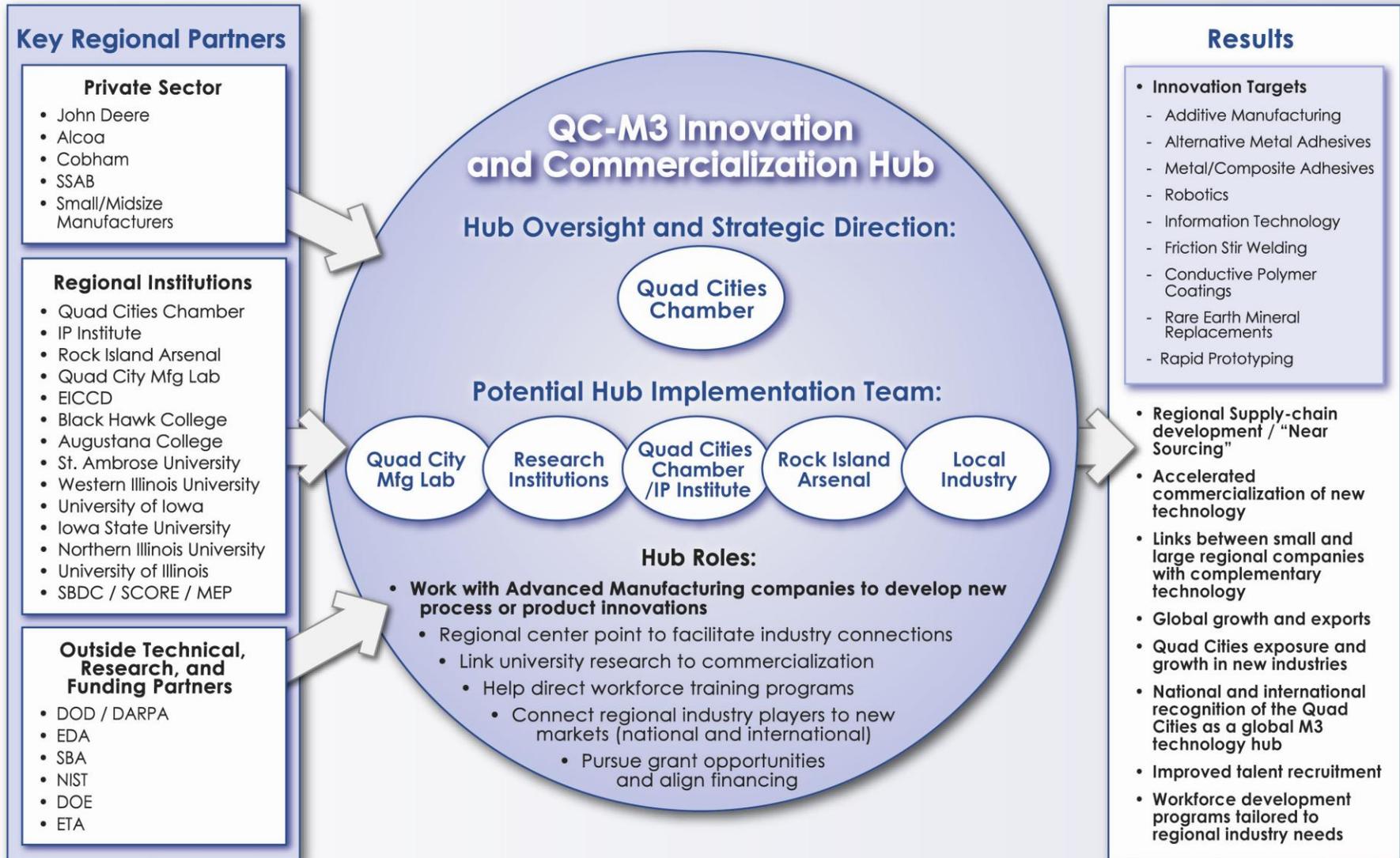
3) STRATEGIC FRAMEWORK

Capitalizing on the opportunities described above will require a clear strategic framework that establishes the systems and partnerships needed to help unleash the innovation potential embedded in the Quad Cities region. Despite the Quad Cities' abundant existing strengths and growth potential in the M3 sector, innovation and commercialization will not happen on its own. Rather, it will require a regional strategy built on public/private and business-to-business partnerships. To be successful, the region needs to unite behind a common vision for how to advance and grow this vital sector of the economy. This effort will need to include industry leaders, the public sector, economic development leaders, and the research and education community.

The following "Strategic Framework" diagram provides a concept for creating an "Innovation Hub" focused on advanced manufacturing in the M3 sector. The purpose of this Innovation Hub would be to create a regional centerpoint for the industry. The Hub would become the nucleus of the region's M3 cluster that helps create business partnerships, links research to commercialization opportunities, supports existing industry, and helps market the region's strengths in the sector. The hub could exist as a physical location, or it could be purely virtual and exist as a set of programs, activities, and initiatives focused on the sector.

Quad Cities Metals and Multi-Materials (QC-M3) Cluster Strategy

Strategic Framework to Forge Innovation, Job Creation, and Economic Growth in the Region's Advanced Manufacturing Sector



4) CASE STUDIES & BEST PRACTICES

Drawing from related projects and emerging best practices to make the QC-M3 Innovation Hub successful

This report provides an initial concept for a “Strategic Framework” to help advance the region’s M3 Industry. Central to this Strategic Framework is the idea of creating an “Innovation Hub” focused on advancing technology development and business growth by connecting industry leaders, researchers, economic development officials, and others in the region. Evaluating examples of similar projects around the country and best practices for launching an innovation-focused regional hub helps provide insight into how the Quad Cities should approach this undertaking

Case Study

Project: Manufacturing Advocacy and Growth Network (Magnet)

Location: Cleveland, OH

Mission: The Manufacturing Advocacy & Growth Network (MAGNET) in Cleveland focusing on support, education and advocacy for manufacturing in Ohio. MAGNET’s goal is to transform the region’s economy into a powerful, global player. MAGNET acts as a catalyst to help regional development organizations invest wisely in the manufacturing sector by supporting new product development and entrepreneurial services for small- and medium-size manufacturers.

Programs: MAGNET offers and manages a range of programs. These include consulting services aimed at helping companies achieve bottom-line efficiencies through increased productivity and process improvement programs while improving top-line sales through a variety of new product development and growth strategies. Other programs include the Partnership for Regional Innovation Services to Manufacturers (PRISM) to help connect manufacturers to innovation opportunities. MAGNET also emphasizes the creation of local supply chains to link local suppliers with local manufacturers. MAGNET has recently completed 796 projects for 398 manufacturers, helping those companies achieve \$655 million in increased or retained sales, attain \$63 million in cost savings, invest \$195 million in their operations, and create or retain 6,142 manufacturing jobs.

Industry Program Targets:

- | | |
|--|-----------------------------|
| 1. Motor Vehicles | 6. Localizing Supply Chains |
| 2. Small Manufacturing | 7. Advanced Energy |
| 3. Education | 8. Biosciences |
| 4. Talent Recruitment | 9. Flexible Materials |
| 5. Resources for Existing Regional Companies | 10. Electronics |

MAGNET Partners:

- | | |
|-----------------------------------|------------------------------|
| • City of Cleveland | • FirstPower Group LLC |
| • County | • Cleveland State University |
| • Lorain County Community College | • University of Akron |
| • Jergens, Inc. | • McKinsey & Company |
| • Lincoln Electric Holdings, Inc. | • Lumitex, Inc. |

Best Practices

Recognizing the importance of entrepreneurship, technology innovation, and growing regional industry clusters as strategies to cultivate a successful long-term economy, many communities and regions across the country have started launching initiatives similar to the QC-M3. Through these efforts, there is an emerging body of knowledge on how to successfully launch programs and facilities focused on advancing regional industry clusters. The following is a list of several key “best practices”. Several of these strategies are partially drawn from a recent study completed by the U.S. Economic Development Administration evaluating factors that contribute to the success of business incubators while others are drawn from anecdotal project experience.¹

1) **Have a focus...** Target specific technologies, industries, and processes but maintain flexibility to respond to changing needs and trends

Industry cluster initiatives should have clear targets and emphasize specific industries and technologies. However, they should maintain flexibility and keep the focus broad enough to support businesses and innovation that is perhaps only tangentially related to the target industry. In the Quad Cities, the focus of the QC-M3 Innovation Hub will be on industries related to metals and multi-materials. However, because materials are central to so many aspects of advanced manufacturing, this focus will be broad enough to converge with a wide range of industries.

2) **Focus on serving existing businesses, as well as start-ups**

Innovation flourishes when opportunities are created that mix the fresh ideas and perspectives of entrepreneurs and small businesses with the experience, industry know-how, and business acumen of existing large companies. The QC-M3 Hub should strive to both help existing businesses grow and develop new technologies, as well as help start-ups launch their companies. Emphasis should be placed on connecting entrepreneurs, small and mid-sized enterprises (SMEs), and large companies. While respecting proprietary technologies, the Hub should encourage open-source collaborations between researchers, companies, and entrepreneurs that will lead toward innovation and commercialization of technology in the M3 sector.

3) **Develop venture capital partnerships**

One of the core strategies and functions of the hub should be to develop networks and partnerships that will create links between potential businesses and venture capital. This should include links to angel investors as well as more formal VC funds.

4) **Link research professionals and business professionals**

One of the common pitfalls of technology start-ups is that the researchers who develop and commercialize new technologies have different skillsets from business professionals who know how to operate companies. One function the QC-M3 Hub can provide is linking promising technology innovators to a cadre of business professionals that can assist with the commercialization aspects (legal, accounting, management, marketing, etc.).

¹ Incubating Success: Incubation Best Practices that Lead to Successful New Ventures. U.S. Department of Commerce Economic Development Administration. http://edaincubatortool.org/pdf/Master%20Report_FINALDownloadPDF.pdf

5) KEY NEXT STEPS

1) Align Partners – The first and most critical step in advancing the strategic framework for Advanced Manufacturing in the M3 sector is to align partners and stakeholders behind the project. The region’s industry leaders as well as public-sector officials must be educated on the power of this opportunity and brought in to participate in the effort.

2) Create a business plan for the QC-M3 Innovation Hub – The “Strategic Framework” diagramed above calls for the creation of the Advanced Manufacturing “Innovation Hub” in the QC-M3 sector. The region should work to create a detailed business plan for what specifically the Hub is, who operates it, its mission, its programs, its costs, etc. Part of this business plan would be deciding whether it would make sense to build a new Innovation Hub facility somewhere in the region, co-locate the Hub with an existing facility, or operate the Hub as a “virtual” facility without a physical location.

3) Develop and implement specific Hub programs – As part of the business plan, the region should start to create and implement specific programs that the Innovation Hub would provide. These programs may include:

- Forge connections between large and small companies
- Strengthen ties between private sector innovation, research, and government support
- Leverage existing supply chains
- Sponsor late-stage research
- Build global connections
- Unite regional stakeholders behind this effort
- Create mentoring programs to connect potential advanced manufacturing entrepreneurs with experienced business people and researchers

4) Tell the Story – The Quad Cities region has a rich and storied history of innovation in manufacturing and a unique and powerful combination of assets and expertise today. In order for the Quad Cities to be a globally-recognized leader in Advanced Manufacturing in the M3 industry cluster, the region needs to tell its story. The assets that create the region’s opportunities within are quite clear. However, the region needs to collectively do a better job of telling the world about what the Quad Cities does along with its regional capabilities.

5) Pursue Funding – As an innovative project uniting multiple stakeholders to create an innovation hub focused on job creation, business incubation, and workforce training in a key advanced manufacturing sector of the economy, this QC-M3 initiative is a prime candidate for federal funding. Promoting regional collaboration to foster innovation and grow regional industry clusters has been a key goal of U.S. economic development policy over the last several years with an emphasis on manufacturing. This has been reflected in several multi-agency grant applications including the I6 Challenge Grant Program, the Energy-Regional Innovation Cluster grant, the Jobs and Innovation Accelerator Challenge, and others. A key role of the Innovation Hub should be to track grant opportunities and position the project for grant funding.

6) Pursue this Initiative in the Context of a Comprehensive Regional Economic Development Plan – The QC-M3 Innovation Strategy should become one component of a much broader comprehensive economic development plan for the Quad Cities region. As a specific initiative focused on growing the region’s advanced manufacturing sector, the QC-M3 Innovation Hub will be most likely to succeed if it is rooted in a larger overall economic development framework for the region. The Quad Cities needs to create a comprehensive economic development

plan that rally's community leaders and residents behind a common vision for the region's economy. In addition to focusing on business and industry, this economic development plan should integrate strategies related to infrastructure, recreation, quality-of-life, and redevelopment into a shared vision for the region and its economy. The QC-M3 Innovation Hub put forth in this report should then be integrated into this larger plan for the region.