



**Southland Metals, Inc.**

*Catalyzing the most efficient, capable, and accessible metal manufacturing supply chains. The Southland.*

**Concept Paper: Discussion Draft**

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**A NOTE ON THIS DOCUMENT:** This concept paper has emerged from a design process to create a metal manufacturing economic growth intervention in the Southland of Cook County, tying into and leveraging the existing metal, machinery, and equipment production activity in the region. The activities and operations of the organization described here are for discussion purposes, and open to substantial modification.

## Southland Metals, Inc. Executive Summary

Vision: To catalyze the Southland as the leading region for nimble, resilient, and capable metal, machinery, and engineering manufacturing – growing and capturing firms, industries, and markets.

Mission: To create and harness the most accessible, capable, and competitive metal fabrication supply chains in the U.S. to deliver new regional revenue and growth.

Market Opportunity: American manufacturing is changing. The Southland is well-positioned to capitalize on these market opportunities with a broad range of metal, machinery, and engineering firms anchored around nation-leading transportation and logistics infrastructure. Understanding, connecting, improving, and activating the region’s collective metal fabrication capabilities will deliver advantages beyond what any individual firm can achieve. No entity in the Southland, or largely the U.S., focuses on connecting and enhancing such collective assets for shared revenue wins. Southland Metals, Inc. (SMI) will address two near-term market opportunities that arise from an increased focus on supply chain quality, flexibility, and resilience that opens the door for an American manufacturing resurgence:

- ***Collaborative supply chain development*** – Opportunity exists to develop and capture new supply chains and business attraction targets. Identifying such shared revenue opportunities and assembling competitive supply chains from Southland firms will deliver new contracts and markets.
- ***Technology-enabled competitiveness*** – Assembling proactive, strategic supply chains can both capture growing markets beyond what individual firms can deliver and also create the business driver and monetary catalyst to invest in enhanced production approaches. ROI-driven, holistic technology integration support and training will enable the right suite of solutions to win immediate business and drive productivity and profitability – at the production worker, firm, and region levels – into the future.

SMI Approach: SMI is envisioned as an industry-organization that anchors, coordinates, and manages collaborative projects through a hybrid subsidized and fee-for-service revenue model. SMI is planned to initially focus on three, mutually reinforcing activities that establish a nucleus for collaboration and growth:

1. ***Supply chain partnerships*** – identify, assemble, and manage the pursuit of shared revenue opportunities; using these supply chain wins to engage participating firms in projects to enhance...
2. ***Supply chain competitiveness*** – scope and manage targeted productivity projects that increase supply chain success through quick, affordable, and measurable interventions pulling from a broad universe of vendors, partners, and support programs; and, as more firms participate and capacities increase through supply chain an competitiveness projects, move towards more systematic...
3. ***Data-enabled business development*** – collect, analyze, and market regional metal manufacturing capabilities and advantages targeted towards aligned market opportunities.

Catalyst for Growth: SMI aims to create and strengthen firm engagement and other collaborative activities. Creating an integrated, efficient, and accessible metal fabrication system will establish a global position and brand that can additionally serve as an equally powerful business attraction tool. This nucleus can over time drive further cluster initiatives, such as inclusive workforce systems development, a physical productivity hub, supplier parks, and/or enabling environment and infrastructure projects (e.g., regional 5G deployment). Success will lift up a struggling region by strengthening existing Southland manufacturers and establishing a marketable competitive advantage that attracts new firms.

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## Introduction

### South Suburban Economic Growth Initiative

Southland Metals, Inc. (SMI) is a project of the South Suburban Economic Growth Initiative (SSEGI)<sup>1</sup>, a comprehensive economic growth collaborative that brings together the weight and tools of the public and private sectors to reestablish the South Suburbs as an economic powerhouse. SMI reflects the SSEGI focus on supporting and growing the region’s core assets – its companies and people. Southland manufacturing firms, infrastructure, and resources rival any place in the world. The region has the tools needed to harness these strengths to realize the potential of digital manufacturing. The goal is to grow local business and create a magnet that attracts new original equipment manufacturers (OEMs) and suppliers, as an integral part of SSEGI’s overall effort to restore the South Suburbs as a driver of inclusive prosperity for the metropolitan region. (See [SSEGI.com](https://www.ssegi.com) for more information on SSEGI and its quarterback agency, the new Southland Development Authority.)

### SMI concept development

The Phase 1 SSEGI market analysis and strategy report identifies key industry clusters centered in the Southland, including Metals, Machinery and Equipment (MME). The report notes that, “As industry supply chains restructure (e.g., in food manufacturing) and innovation dynamics change (e.g., toward more collaboration/’co-opetition,’ often centered in small firms and entrepreneurs), South Suburban firms have opportunities to drive innovation in developing new products and processes, or to enter new supply chains and markets, both local and global.” SMI concept development is an SSEGI Phase 2 effort to establish market-driven economic growth interventions that activate such opportunities for Southland MME firms.

The resulting SMI focus and strategy aims to serve as a catalyst for inclusive economic growth, through the following drivers of inclusion:

- **Employment** – improving the functioning of labor markets so that workers of all skill levels and backgrounds are efficiently prepared, matched and upskilled for quality jobs with strong career ladders. The MME sector presents more opportunities for inclusion than others; it provides decent entry-level jobs (most do not require a college degree – see Table 1) with good career paths and average wages (see Table 1). Opportunities for higher-wage careers exist in emerging digital manufacturing occupations, which SMI’s technology-enabled competitiveness focus will drive forward in the Southland.
- **Ownership** – Growing company ownership by people of color to generate wealth creation and capture, especially by finding opportunities in high growth industries, as well as real estate ownership in residential, commercial and industrial development. The rapid changes in the structure of the manufacturing industry create accessible opportunities for entrepreneurs and SMEs to enter the sector and grow specialized services that respond to market needs.
- **Location** – siting and supporting firms in places that are readily accessible to disadvantaged populations. MME firms often locate in or near disadvantaged neighborhoods, on re-developed urban industrial land. This provides employment opportunities in proximity to underserved populations while also improving neighborhood amenities (e.g., by repurposing abandoned land for productive uses).

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<sup>1</sup> SSEGI is a cross-sector partnership encompassing the business, political and civic leadership of 34 suburbs in South Cook County. Participants in SSEGI have collaboratively created a new development authority and are undertaking a major, comprehensive effort to transform the economy of the Southland, reestablishing the South Suburbs as prosperous, vital communities that participate in and drive growth in the regional economy.

- **Participation** – ensuring diverse representation of all races, genders, backgrounds, national origins, etc., at the relevant private, public and civic sector “tables,” where growth strategies and economic policies are shaped. Good career ladders in the MME sector are important in providing pathways to leadership-level positions of influence within companies.

MME occupations	Wages, 2019 *Wages reported are 2018		Job Zone
	Hourly	Annual	
	Median	Median	
Computer-controlled machine tool operators, metal and plastic*	19.16	40,070	3
Cutting, punching, and press machine setters, operators, and tenders, metal and plastic	17.20	35,765	2
Engine and other machine assemblers	19.13	39,800	2
First-line supervisors/managers of production and operating workers	29.90	62,185	2
Inspectors, testers, sorters, samplers, and weighers	20.03	41,650	2
Machinists	21.13	43,945	3
Mechanical engineers	38.81	80,720	4
Metal-refining furnace operators and tenders	20.67	42,990	2
Molding, coremaking, and casting machine setters, operators, and tenders, metal and plastic	17.93	37,280	2
Rolling machine setters, operators, and tenders, metal and plastic	21.46	44,640	2
Team assemblers*	15.19	31,590	2
Tool and die makers	24.81	51,590	3
Welders, cutters, solderers, and brazers	19.87	41,335	2.5

Table 1: The MME occupations listed are those that fall within NAICS 331, 332, or 333 according to BLS [https://www.bls.gov/iag/]. Job Zones are on a scale of 1-5, 5 indicating significant education/training requirements. Job zone 2 requires a high school diploma or less, and Job zone 3 requires an Associates’ degree or less.

Inclusive growth practices that increase the employment, ownership, access and participation of communities of color in the Southland’s MME cluster are essential to achieving lasting economic growth within the sector. SMI will help achieve this: its initial focus on supporting and growing local manufacturing firms serves as a seed for a broader suite of inclusive industry, cluster, and workforce initiatives that collectively drive increased productivity, wages, skills, along with overall business and tax revenue for challenged Southland municipalities. The SMI concept was developed through research and analysis of the Southland MME firm dynamics and support landscape, coupled with national and global market trends and current models and best practices for enabling regional manufacturing competitiveness. Local investigation included quantitative economic output data and qualitative assessment and discussions with key regional stakeholders and firms.

### Southland Landscape and Opportunities

Extensive regional analysis contextualizes the Southland MME economy and provides insights into Southland strengths that can be exploited and furthered, along with weaknesses that can be mitigated through the SMI economic growth intervention. Synthesized assets and liabilities are highlighted here.

### Regional Assets

**Firm Density and Diversity:** Southland firms reflect a broad range of fabrication processes and industry verticals, indicating potential ability and flexibility to create new products and supply chains. MME firms fall into the following NAICS categories:

- Primary Metal Manufacturing: NAICS 331
- Fabricated Metal Product Manufacturing: NAICS 332
- Machinery Manufacturing: NAICS 333

In the Southland, 228 active MME firms were identified<sup>2</sup> that generated \$2.85B in revenue and employed approximately 9,000 workers in 2019. These figures represent a conservative estimation of MME activity (since, even if a firm fell within NAICS 331-333, it was removed from the analysis if it was inactive, changed locations, or had business activity not directly related to metal manufacturing). Southland MME firms encompass close to 30 four-digit NAICS codes; firms in 11 four-digit NAICS codes generated between \$50M and \$200M in revenue. Steel product manufacturing (\$643M) and motor vehicle parts manufacturing (\$528M) command 41% of regional revenue. When looking at firm quantity: 24% of MME firms are machinery manufacturers and 12% are primary metal firms (e.g., raw metal foundries). Machine shops – metal fabrication including lathes, boring, grinding, and milling – represent the largest firm count (37 out of 225). Machine shops and other fabricated metals firms are most likely to seek new business and market opportunities – due to their relevance to a wide range of industries. A U-joint machine shop looking at expanding from its core automotive focus to additional defense and aerospace customers represents one example.

Phase 1 SSEGI work noted that the South Suburbs have double the MME density as the broader Chicago Region (Location Quotient (LQ) of 2.03 compared to 1.02)<sup>3</sup>. Additionally, both employment and LQ for Southland MME firms have fared significantly better than the Chicago MSA; employment growing 5% from 2004-2014 versus declining 21%, and LQ increasing 38% versus a 6% decrease.

Despite the fact that Southland MME industries have fared better than the Chicago region, this economic anchor is still at risk. The Southland lost nearly 200 firms and 33% of employment from 2009-2015<sup>4</sup>. Real revenue decreased 40% during this same period. Output per employee, though, grew 37% from 2004-2014<sup>5</sup> helping to explain the relative aggregate Southland MME resilience compared to the larger MSA. By investing in the Southland's current assets there is opportunity to accelerate revenue growth once again.

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<sup>2</sup> Dunn & Bradstreet, NETS, InfoGroup, and the local databases from the Calumet Manufacturing Industry Sector Partnership ("CMISP") and the Chicago Defense Resiliency Program. Analysis and data cleaning across these data sets was intended to provide a deeper look at Southland MME firms. Over half of the original collective database were deemed to not be active, local metal manufacturers based on business-type and/or location. Omitted firms include mis-classified firms (e.g., locksmiths), shuttered firms, and those that relocated based on current listed address. Due to the limitations of NAICS codes, revenue and employee estimates, this data should only be used to begin understanding the capabilities of a region. Activities to further determine the regional capabilities of the Southland MME firms are described as part of the SMI strategy.

<sup>3</sup> SSEGI Phase I Report

See Appendix A for more detail on the methodology and regional data analysis.

**Opportunity:** Collaboration that integrates both vertical (e.g., raw materials, metal part fabrication, heat treatment and other finishing steps, and assembly) and horizontal (e.g., fasteners, support structures, and joints) suppliers can establish a collective and highly competitive set of regional capabilities and capacity that right and grow this key Southland industry.

**Leading Infrastructure:** The Southland enjoys unique logistics and other assets that position the region to benefit from the future American manufacturing economy focused on speed, nimbleness, and customer collaboration. Four major interstates – I-80, I-294, I-57, and I-394 – are accessible to the Southland. Union Pacific and Canadian National railways operate intermodal sites. A planned smart logistics hub could position the Southland as a next-generation leader in transportation and logistics. These assets are already a draw to MME firms. Approximately 50% of the manufacturers are in three areas – Alsip, Chicago Heights, and South Holland. When including the next four highest concentration areas (Harvey, Blue Island, Lansing, and Posen) over 75% are represented. These geographies and specific companies' locations tend to be clustered around railroad and intermodal facilities (See Appendix A, "Southland MME Firm Location" diagram).

In addition, electricity costs, reliability, and business energy efficiency programs compare favorably with other states. New technology and data-intensive manufacturing approaches become less costly with low utility rates.

**Opportunity:** Develop regional MME-focused supply chains that serve OEMs and large suppliers. Customers within 250 miles of the Southland may be particularly well-suited targets for on-demand production.<sup>6</sup> The current economic crisis further emphasizes the importance of building regional supply chains and developing local nimbleness/resiliency, as many national/international shipments have slowed.

This will also decrease costs of warehousing and inventorying that add up as products in global supply chains await shipment to the next supplier. Transportation and inventory were previously found to comprise around 70% of logistics costs<sup>7</sup> and therefore enabling more local, on-demand vendors can decrease these expenditures.

**Commitment to manufacturing growth:** Numerous manufacturing organizations and support programs – including the Calumet Manufacturing Industrial Partnership (CMISP), the Chicago Defense Resiliency Program, Calumet Area Industrial Coalition (CAIC), and SouthWorks – provide a wealth of business networking, operational support, and workforce programming. Highlights include the SouthWorks robotics competition that serves to excite students from 20 high schools about next-generation manufacturing careers, the CAIC apprenticeship network, and the Department of Defense (DOD)-funded defense supply chain mapping tool which seeks to identify and support current and potential defense suppliers. (See Appendix B for more details on regional manufacturing support initiatives.)

**Opportunity:** Better connecting these manufacturing support activities around shared, industry-driven strategy and measurable, immediate business value can increase program utilization and impact.

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<sup>6</sup> About 250 miles was noted as the targeted distribution range by a raw metal company in the Southland and the Greater Peoria Manufacturing Partnerships. There is also a large consumer market in Chicago to support this.

<sup>7</sup> Establish, Inc/Herbert W. Davis and Company. 2006 Database.



**Strong regional R&D and innovation:** The Southland is situated alongside a unique manufacturing R&D and innovation ecosystem. The federal digital manufacturing institute, MxD, is a globally-unique Chicagoland asset which brings together large manufacturers – like Boeing, Illinois Tool Works, and Rolls Royce – with leading research universities to build new digital manufacturing solutions. And, the nationally recognized mHUB product innovation center has created a community of over 1,000 engineers, innovators, and entrepreneurs that has launched over 1,000 products and provided engineering innovation support to large manufacturers. Collectively, these R&D and innovation efforts are creating a nucleus for manufacturing technologies. Examples include mHUB incubated-Amper which helps plant managers improve machine and labor productivity by monitoring key metrics of each machine in real-time. And also, MxD-housed Fast Radius that provides production grade additive manufacturing solutions. This trajectory will likely increase with the planned launch of an mHUB innovation fund and accelerator program.

**Opportunity:** Translate one-off Chicagoland region advanced manufacturing wins to an innovation engine that accelerates the currently slow market adoption of local technologies and establish a true competitive advantage for MME firms enabled from their proximity to MxD, mHUB, and leading research universities. The Chicago region technology competitiveness organization, P33, has a “Tech Connect” initiative that is envisioned to focus on this goal.

#### Regional Liabilities

**Challenging regional narrative:** Regional business attraction and retention in the surrounding area focuses on tax rate marketing and incentives. Southland taxes are a perceived weakness by MME firm. More “favorable” Northern Indiana and Will County geographies offer nearby alternatives.

**Opportunity:** Shift business attraction from an incentive-based to a value-based approach. Enabling turnkey, capable, and cost-competitive supply chains can establish a measurable and marketable regional value proposition would stem and supersede this negative narrative. Such an MME firm growth strategy and branding effort would amplify the broader Southland efforts – like the Southland Development Authority – to raise the “tax value proposition” that assesses the return on tax investment (versus sheer tax contribution).

**Workforce pipeline:** Demand for manufacturing workforce is pervasive as the incumbent workforce ages. The Illinois Manufacturer’s Association stated that half of Illinois’ nearly 500,000 manufacturing workers are projected to retire in the next 10-15 years. The IMA noted that insufficient workforce capacity is available statewide to fill the accelerating attrition. In addition, the nature of manufacturing work is shifting requiring new training pathways and upskilling efforts. Workforce pipeline was the number one challenge cited by local manufacturers, both in individual conversations as well as through umbrella initiatives like CMISP. Last-mile credentialing and apprenticeship programs at Prairie State College and elsewhere in the meantime struggle to enroll participants.

**Opportunity:** Solutions that augment capacity and productivity should be pursued in parallel to building and filling the future skilled workforce pipeline. The higher concentration of middle-skilled and former manufacturing workforce in the Southland<sup>8</sup> coupled with a density of workforce training initiatives in the

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<sup>8</sup> Phase 1 SSEGI Report

region creates opportunity to retain and upskill the shop floor labor force to utilize new automation and robotics technologies.

**Low-yield marketing and business development:** Existing business development activities are inefficient and often create a zero-sum movement of revenue between firms, usually with decreased profit margins. Southland business development was observed to be largely organic and at the firm-level. Limited proactive marketing and business development activities were observed. Noted tools included websites, business networking events, digital marketing, and contract business development services. Of the 225 identified Southland MME firms, about 17% do not have a website and about 36% of the websites were observed to be inadequate at describing the firm's capabilities. One firm stated it spent \$5,000-10,000 per year for aerospace lead generation and could not point to any new revenue generated through the contract.

**Opportunity:** Curated, qualified, proactive lead generation would increase the ROI for firm marketing and business development. Generating shared revenue wins will provide a higher yield for individual firms while generating net regional revenue growth and diversifying the MME economy. Facilitated supply chain development would be aided by deeper knowledge of and connection across regional firms through collective analysis of regional capabilities and more effective partnership mechanisms.<sup>9</sup> Existing data sets and databases provide an incomplete view of the region based largely on NAICS codes. Fully understanding and aggregating the region's capabilities would be a powerful tool.

**Need to modernize:** Former Federal Reserve Chairman Ben Bernanke has said that productivity growth is "perhaps the single most important determinant of average living standards". The growth of productivity - output per unit of input - is the fundamental determinant of the growth of a region's economic output and material standard of living. Modernization and technology-adoption will be strong productivity driver into the future. National trends and conversations with local firms revealed barriers to modernizing included the ease and perceived cost of understanding, vetting, and ascertaining the ROI from new technologies and solutions. Tradeshows were a primary source of information for firms that stated they had investigated options. One machine shop executive articulated the challenge with this approach, observing the challenge to appropriately scoping solution needs through individual vendor conversations and wound up overinvesting. Most firms appear to err towards not pursuing new technologies or solutions rather than make the wrong choice.

**Opportunity:** Incentivize firms of all sizes to adopt new productivity solutions by tying improvements to tangible revenue opportunities. Provide neutral, knowledgeable, holistic support in scoping productivity needs and identifying and managing implementation of the right suite of solutions, particularly in the context of specific new market opportunities. There is also an opportunity to rent new digital manufacturing machinery to small firms to test small-batch production – allowing them to verify its value before making an investment in a new technology or solution.

**Limited firm engagement:** While further investigation is needed, multiple conversations anecdotally suggest that metal fabrication firms - while representing over 50% of MME firms – have limited active collaboration. In addition, participation in regional efforts to connect firms around business and workforce

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<sup>9</sup> Interviews indicated a need for this – to better understand what the region is producing and which firms are partnering.

development, like CMISP, has been limited. The lack of immediate, measurable value of such initiatives to firms was a noted barrier to participation.

Opportunity: Focus on measurable business value to energize firms. Create just-in-time access to the right support program for the right need to promote access, utility, and impact of existing initiatives and programs.

**Changing manufacturing perceptions:** Workforce development is a top priority for Southland MME firms. Yet, a Manufacturing Institute survey indicates that manufacturing is the least favorable career by GenY (age 19-33)<sup>10</sup> calling the future MME workforce into question. Efforts such as *Dream It. Do It.* seek to change this perception of manufacturing jobs as dirty, dark, and dangerous.

Opportunity: The future shop floor jobs will look more like technology jobs and offer high-wage career pathways. There is opportunity to better market this type of manufacturing, to change traditional perceptions and generate increased interest in pursuing these careers.

## Southland Metals, Inc Overview

### Vision and Mission

SMI is envisioned as an industry-organization that anchors, coordinates, and manages collaborative projects through a hybrid subsidized and fee-for-service revenue model. Delivering success stories, firm engagement, and a collaboration platform to advance supply chain and cluster activities can create a foundation for additional objectives, activities, and future wins. The resulting impact will lift up a struggling region by strengthening existing Southland manufacturers and establishing a marketable competitive advantage that attracts new firms.

Potential mission statement:

*SMI's mission is to catalyze the Southland as the leading region for nimble, resilient, and capable metal, machinery, and engineering manufacturing - growing and capturing firms, industries, and markets. The organization will do so by creating and harnessing the most accessible, capable, and competitive metal fabrication supply chains in the U.S. to deliver new regional revenue and growth.*

### Initial Objectives

Multiple objectives related to new revenue and improved productivity were considered during the concept development process due to the strong resonance of these high-level goals with stakeholders. An initial focus on measurable ROI for Southland manufacturers is recommended based on the variety of firm-level support programs, the observed challenges to engagement and collaboration by Southland manufacturers, and the barriers to making informed investments in modernizing production capabilities. Understanding, connecting, improving, and activating the region's collective metal fabrication capabilities can deliver advantages beyond what any individual firm can achieve. No entity in the Southland focuses on connecting and enhancing such collective assets for shared revenue wins. The proposed SMI aims to deliver

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<sup>10</sup> Manufacturing Institute and Deloitte, "The Skills Gap in U.S. Manufacturing: 2015 and Beyond," 2015.

immediate, measurable digital manufacturing wins through new revenue opportunities, while seeding a “systems-level” economic and business development model for the Southland.

Initial objectives include:

- Establish a measurable and marketable regional competitive advantage
- Share cost of new business development
- Deliver shared business wins that would not be achievable at the individual firm level
- Identify and assemble new, high-growth, resilient supply chains
- Create incentives and needed support to adopt digital manufacturing solutions

## Market Analysis

SMI objectives were identified and supported by market analysis that aligned global opportunities with the local Southland MME industry context described above. A window exists to establish market share and competitive advantage for significant domestic metal fabricated parts and products revenue opportunities. International trade policy, steel prices, and shifting OEM requirements have reopened the metal manufacturing landscape after years of low-labor cost dictated location and purchasing decisions. Recent novel Coronavirus-driven production and supply chain challenges – including for GM trucks<sup>11</sup> – create additional momentum for domestic, regional production.

The future of manufacturing American manufacturing revolves around flexibility, predictability, and capability. This repositioning is both possible and necessary to remain competitive as global strategies and investments create a new metal manufacturing landscape. The German Industry 4.0 Strategy, for instance, focuses on automation and mass-customization capabilities. China, which for decades had won business based on low labor costs, is now investing in technology-enabled production quality, along with vertical integration including a focus on primary metal production.

New customer-supplier collaboration can favor American firms with the right capabilities. A digital supply chain creates the potential for OEMs to build manufacturing supply systems rather than individual partners. When fully implemented, capability, capacity, cost, and quality can be determined and sourced. And, all internal operations such as ordering, scheduling, shipping, and invoicing can be seamlessly coordinated. Suppliers, in turn, can utilize computation, data, sensors, analytics, and automation to deliver optimized quality, part performance, and cost. McKinsey and Company projects that digital supply chains could “not only significantly increase supply chain agility, but also potentially reduce operational costs by 30%, lost sales by 75%, and inventories by as much as 75%”<sup>12</sup>. Productivity at all levels – worker, firm, and region – enabled by digital transformation is vital to the Southland’s economic transformation. The Southland Metals, Inc. initiative will inclusively grow the MME industry by enabling small, local manufacturers to scale their production and target market, thus increasing their revenue. This initiative further drives inclusion through its alignment with other SSEGI programs that focus on diverse workforce preparation and increasing minority ownership of firms.

This digital supply chain manufacturing future focused on quality, capability, and total cost of ownership includes the items below. It should be noted that the reference to “Total Cost of Ownership”

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<sup>11</sup> Coronavirus impact spreads to European auto plant and could hit GM truck production. Michael Wayland. CNBC. February 14, 2020.

<sup>12</sup> Supply Chain 4.0 – the next-generation digital supply chain. McKinsey and Company. October 2016

takes all relevant factors into account such as shipping and customs fees, overhead, communication issues, time to market, inventory management costs, intellectual property risks, and other business considerations (this differs from procurement cost which usually only reflects the direct unit cost).

- On-demand supply deliveries and production eliminate the need for warehousing
- Suppliers work collaboratively with OEMs to design and deliver new products
- Cost of labor and procured cost become less important than total cost of ownership inclusive of transportation, warehousing, and other inputs
- Proximity to customers and ease of distribution create emphasis on logistics and service region
- Sales, procurement, shop floor, fulfillment, service, and billing functions work seamlessly and collaboratively to manage product life cycle
- Products and processes are optimized and qualified virtually driving out design and build time, cost, and waste
- Customized parts and low-volume runs are not only feasible, but profitable

### New Metal Manufacturing Revenue Opportunities

Changing manufacturing dynamics and an increased focus on total cost of ownership open up the potential for regionally anchored supply chains. Regions that orient themselves to meeting the evolving requirements and priorities of OEMs and other purchasers position themselves to capture significant market opportunities and attract new firms. The range of Southland metal fabrication firms and their collective capabilities offer a nucleus to realize these opportunities.

#### Reshoring

Reduced labor costs and decreased oil prices positioned countries like China as attractive manufacturing locations, including for metal fabricated parts. Quality, fulfillment time, and other considerations are shifting the equation, however. While a recent survey by Plante Moran concluded that about 70% of decision to buy imports are price driven, the Reshoring Institute calculates that firms underestimate offshoring costs by 20-30% and that 25% of offshored products can be produced domestically with the same sale price. A BCG study determined that goods where labor makes up 39% or less of the total cost are prime reshoring candidates, with metal fabrication falling squarely in that range<sup>13</sup>. This conclusion is supported by a study of reshored jobs between 2007-2014 where six of the top 10 industries were metal manufacturing-related (transportation equipment, electrical/appliance components, computer/electronic products, machinery, fabricated metal products, and medical equipment)<sup>14</sup>. Thus, helping firms calculate and market the total cost of ownership advantages for manufacturing domestically can yield significant new business opportunities. In addition, improving metal manufacturer productivity can unlock even more favorable reshoring economics. Focused reshoring efforts have grown over the past 10-years. From 2013-15 machinery manufacturing and fabricated metal producers, for instance, returned 2,860 jobs and 1,721 jobs, respectively<sup>15</sup>.

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<sup>13</sup> The U.S. Manufacturing Renaissance: How Shifting Global Economics are Creating an America Comeback. Boston Consulting Group. 2017

<sup>14</sup> Reshoring Institute data

<sup>15</sup> Reshoring Institute data

Opportunity: The range of metal fabrication firms and presumed capabilities suggests the Southland is well-suited to pursue reshoring opportunities. Analysis of import-export data, OEM partnership development, and other efforts to identify reshoring targets can bring new revenue and jobs into the region. Large purchasers and OEMs are actively seeking domestic supply chains. Walmart, for instance, has pledged to purchase \$250B in products that support American jobs through the *Jobs in the U.S. Manufacturing Portal (JUMP)*. In addition, government contracts – particularly for products with national security implications – are increasingly preferencing, if not mandating, domestic suppliers. Low volume, value-added parts requiring mass customization, high-performance materials, or rapid fulfillment are particularly attractive reshoring targets.

#### Defense Supply Chain

The defense manufacturing sector is undergoing a strategic realignment. The 2018 White House report, “Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States” outlines a number of factors that threaten American defense readiness. The report outlines how the global distribution and lack of investment of the American defense supply chain currently hinders manufacturing innovation, capability, and responsiveness. Reliance on single vendors and overseas production are specifically called out. From 2000-2018, for instance, the import rate in the defense-related industrial controls and machine tool sector more than doubled. The Southland can target such contracts.

Metal-related manufacturing for the U.S. Department of Defense is already a strong Illinois market. \$1.3B in metal-related DoD manufacturing contracts were awarded in 2016 based on Illinois Defense Network (IDN) reporting. The broader Chicagoland region is home to Boeing, Navistar, Northrop Grumman, and ITW who collectively represent a significant share of defense funding. The DoD Office of Economic Adjustment-funded Chicago Defense Resiliency Program has launched multiple efforts to understand and grow the defense manufacturing supply base. The Defense Supply Chain Mapping tool has limits, including the limitation to prime contractors and tier-1 subcontractors. Qualitative review of Southland metal manufacturing firm websites revealed a number of tier-2+ defense contractors. Additionally, existing data and tools are limited to existing defense contracts and do not identify the larger subset of firms with the potential to participate in defense supply chain opportunities.

Opportunity: Data mining of DoD contracts, deeper understanding of Southland firm capabilities, and competitive bid development are needed to fully understand and exploit the DoD revenue opportunities. Chicago Magnesium, for instance, may have unique aluminum and magnesium sand casting capabilities, a mission-critical gap identified in the 2018 White House defense manufacturing strategy report. Defense contractor vendor certification, cybersecurity qualification, and other currently underutilized regional defense manufacturing offerings can be aligned around specific contract pursuits. The National Center for Defense Manufacturing and Machining and Automation Alley currently offer elements of defense supply chain development, including defense industry networking and reverse engineering of legacy weapons and vehicle systems.

#### Emerging Markets

New product categories and industries create new market opportunities. With no incumbent supplier base, regions like the Southland who can deliver efficient and capable end-to-end production stand to capture these high-growth potential supply chains. Potential relevant emerging markets for the Southland include:

- Data centers: Data is becoming the new global currency. Digitization of industrial processes, the rise of cloud computing, and new Internet of Things applications like smart hospitals and autonomous vehicles push the creation and storage of data exponentially. Data center server market is expected to grow to \$56B with a 13% CAGR between 2019 and 2023<sup>16</sup>. Server infrastructure includes multiple metal components subjected to thermal and electrical stresses, including busbars, chassis, and server racks. South Suburban firms and regional data center companies that already have a presence in this rapidly expanding market include Panduit, Allied Tube and Conduit, Triton Manufacturing, and Equinix.
- Smart logistics: Automation of logistics - from Amazon smart warehouses to automated seaports – is accelerating the transportation and distribution of goods. The Internet of Things in logistics market is expected to reach \$63B by 2026 with 12% CAGR<sup>17</sup>. Smart logistics aligns with broader Southland economic development objectives and efforts. Growth in these markets would drive demand related to cranes and intermodal infrastructure, including metal components. Potential Southland manufacturing supply chain partners including Mi-Jack, Whiting, Bimba, and IFM.
- Autonomous vehicles: The future of transportation likely lies in a distributed network of autonomous vehicles with a sizeable potential market of \$615B by 2026 with 41% CAGR. Building supply chains that can integrate new electronics and emerging electric battery technology to traditional vehicle manufacturing is important to maintaining the Southland’s automotive industry market position. The region is proximate to leading battery materials work at Argonne and elsewhere. Regional firms such as Ford, Continental, HERE Technologies, Bosch, Google, Microsoft, and Bimba, along with Central Illinois-based Rivian are potential partners.
- Small, modular nuclear reactors: The federal government has identified modular nuclear power as a high-potential clean power source. The Department of Defense values the possibility of scalable off-grid electric for forward military bases. And the Department of Energy is looking at modular nuclear energy as an answer for distributed power, including in rural communities. 70 pilot sites – including Argonne National Laboratory – are currently competing to become the design for future, all of which fit on the back of a flat-bed semi-truck. The ultimate small, modular reactor design will need to be manufactured in masse to meet planned demand. The Southland has the potential to draw from regional excellence in new alloys, production of high-performance metals, and nuclear expertise to create a first-mover opportunity.

Opportunity: Identify and build relationships with key product developers and OEMs leading new market creation. Understand, define, and deliver on supply chain requirements to accelerate customer speed to market, while establishing first-mover advantage for the Southland. An initial critical mass within an emerging market may create a nucleus for a new Southland MME-based cluster.

### Increased Productivity

Technology is viewed as an attractive means to realize the described market and supply chain opportunities. But technology-adoption itself has not been an imperative. The results of a survey by the Society for Manufacturing Engineers outline the opportunities and realities to digital manufacturing solution adoption. While productivity, improved operations, better/faster decision making, and increased competitiveness top the list of perceived benefits, only 30% of surveyed firms were in the process of

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<sup>16</sup> Data Center Server Market Worth USD 56.64B, at 13% CAGR During 2019-2023. Technavio. June 27, 2019

<sup>17</sup> Internet of Things (IoT) in Logistics Market Snapshot. Transparency Market Research. November 30, 2018

implementing or using Smart Manufacturing solutions<sup>18</sup>. The top cited adoption barriers included cost, knowledge of solutions needed, and uncertainty of benefits, consistent with qualitative observations in the Southland. McKinsey's Digital Capability Centers and BCG's Innovation Center for Operations seek to model benefits, but largely focus on large corporations with the discretionary resources to invest. These findings are again consistent with qualitative investigation of Southland MME firm technology adoption.

Technology, however, is an important tool to addressing business needs and opportunities. Three representative examples are described here.

#### Maintaining and scaling productivity and capacity

**Challenge:** Maintaining and growing capacity and productivity in the face of dwindling workforce remains a top concern in the U.S. despite federal and other support efforts in place. Technology-enabled gains are needed to stem projected productivity and capacity declines, while reshaping American manufacturing for the future. In particular, there is a need to improve productivity and capacity in segments of the regional supply chain that are most vulnerable to overseas competition.

**Opportunity:** Commoditized fabrication of high-volume, simple metal parts is a major component of all metal manufacturing and the sub-set most susceptible to overseas competition. This includes the stamping, forging, milling and other fabrication techniques of steel and other common metals – largely represented by NAICS code 332. Procurement of such components is largely cost-driven. Improving quality, cost, and efficiency at the individual firm level helps improve the competitiveness and profitability for such commoditized parts where margins continue to decrease, even under increased labor constraints.

**Technology-enabled value:** Productivity improvement solutions such as sensors, data analytics tools, augmented reality workflow management tools, and digital metrology (part inspection) – monitor and optimize production to maximize efficiency and minimize material waste. Automation and robotics, specifically, enable firms to augment workforce capacity by offloading rote tasks, augmenting workforce capacity and freeing up available shop floor workers to perform more analytical, decision-making tasks. Universal Robots (Teradyne), a cobot manufacturer, experienced a 38 % sales growth in 2018 for a total of \$234 million indicating accelerated adoption.

#### New advantages through value-added production

**Challenge:** Meeting the evolving customer needs defined above cannot, at times, occur through established MME production processes. New capabilities, materials, and skills are increasingly required to realize better quality, performance, and cost. For instance, the U.S. Navy is seeking new approaches to fabricating large parts such as ship impellers. The aviation industry has established new targets ranging from lightweighting jet engines to the use of embedded sensors and data to improve predictive maintenance for critical parts.

**Opportunity:** OEMs are increasingly looking to partner with suppliers on part design and production. Connecting unique capabilities, including across firms, can help deliver solutions to these customers. Partnering a metal alloy design firm (e.g., Chicagoland-based QuesTek Innovation) with a local primary metal firm that can mass produce the new alloy and a machine shop that can determine how to turn the material into the required part establishes a unique value-added supply chain.

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<sup>18</sup> *Manufacturing in the New Industry 4.0 Survey*. Society for Manufacturing Engineers. March 2018.



**Technology-enabled value:** Design tools enable firms to rapidly design and iterate new processes, materials, and products. Modeling and simulation tools such as finite element analysis (FEA), integrated computational materials engineering (ICME), and 3D printing are representative solutions. The Chicago region is home to leading organizations and firms across these areas, including the Argonne Leadership Computing Facility (modeling and simulation), QuesTek Innovation (ICME), and Fast Radius (3D printing). Prior Illinois efforts including the National Digital Engineering & Manufacturing Center (NDEMC) and the Illinois Manufacturing Lab demonstrated the value of digital design tools. Illinois' two high performance computing facilities provide a unique resource for compute-intensive applications.

#### Efficient, nimble, and integrated supply chains

**Challenge:** Suppliers account for 50-70% of a typical manufacturer's final production value and represent two-thirds of a manufacturer's total cost<sup>19</sup>. This process optimizes for cost on individual components, but often does not account for overall costs including transportation and inventorying materials. While many legacy industries do not fully engage the internal engineering and manufacturing to ensure that the specifications are met, highly-regulated industries like aerospace and defense are driving increased supplier controls and collaboration. In addition, different internal systems and processes silo procurement, production, fulfillment, and operations data creating inefficiencies. For example, recent Explorer and police interceptor production issues at Ford's Chicago plant could potentially be mitigated by an accessible, resilient, nimble local part supply chain. Manufacturing support organizations, like IMEC, are creating training and services to enable Enterprise Resource Planning (ERP) software adoption to assist with firm-level challenges.

**Opportunity:** The ability to simplify procurement and production by integrating multiple part vendors and improving cost and quality is needed to drive revenue without reducing margins for domestic production to near zero. Efficient, turnkey supply chains create a unique advantage when no incumbent supply chain exists for new products, companies, and markets. Speed matters when competing to launch new products, especially when there is a race for first-mover status. Battery supply chain challenges, for instance, were a significant bottleneck in launching and scaling the electric vehicle market. Establishing a turnkey, capable supply chain accelerates market entry for such new products, like Rivian's recent 100,000 electric delivery van order from Amazon.

**Technology-enabled value:** Supply chain technologies manage and automate relationships between firms, including purchasing, inventory management, billing, and shipping. 'Digital twins', or virtual duplicates of manufactured products, enable virtual supply chain collaboration. Digital twin technology development and adoption is one Chicago-based MxM manufacturing institute focus. Blockchain technology is projected to improve operational tasks, including factory scheduling and asset tracking. Gartner projects that by 2023, 30% of manufacturing companies with more than \$5B in revenue will have implemented Industry 4.0 projects using blockchain<sup>20</sup>. This adoption will put pressure on these large manufacturing firm's suppliers to follow suit given the integrated system blockchain enables.

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<sup>19</sup> Ensuring American Manufacturing Leadership Through Next-Generation Supply Chain. mForesight. June 2017

<sup>20</sup> How Blockchain Can Improve Manufacturing in 2019. Forbes. October 28, 2018.

## Tailored, Targeted Support Models

The described SMI focus is informed by investigation of 20 regional manufacturing growth interventions through qualitative research and interviews (See Appendix B). Generally, these efforts fall into three broad categories – industry development (focused on systems-wide industry changes), productivity improvement (focused on firm level), and revenue generation. Organizations often lead activities in multiple engagement areas. These models are split between virtual programming and networks and place-based activities. Learnings, challenges, and best practices were synthesized to develop the initial SMI offerings and business model.

### Value Creation Focus Areas

**Industry and cluster development:** Cluster development efforts focus on aligned strategy and resources, along with tactical across a particular industry or set of firms. Such initiatives often execute multiple activities ranging from marketing and branding to workforce development, The Rockford Area Aerospace Network (RAAN) was launched to position and galvanize the over 200 suppliers in the region around branding, marketing, and programming that address workforce and business development needs. The Quad City Metal Innovation Hub is a virtual network aimed at diversifying the Quad Cities regional economy beyond Deere, Alcoa, and the Rock Island Arsenal. The Purdue University-based Indiana MEP is undertaking a \$1.7M project to interview and assess regional manufacturers to understand and start to link these capabilities.

**Productivity initiatives:** Multiple approaches exist to improving manufacturer productivity, largely at the individual firm level. Operational interventions such as Lean Six Sigma training and leadership development training are common offerings from Manufacturing Extension Partnership centers. Technology-focused hubs like Automation Alley and Buffalo Manufacturing Works help firms understand and implement specific solutions. Technology support initiatives include outsourced engineering services, hands-on demonstration activities, and workforce training.

**Product, market, and revenue generation:** Catalyzing the launch of new products and the capture of new business remains a strong manufacturing support model. Examples include EWI applied R&D projects that create competitive products and processes to help firms secure specific business opportunities. Outsourced marketing and business development for individual firms is another commons approach. The Greater Peoria Manufacturing Network alternatively creates a shared entry point for OEMs seeking to do business with the Peoria manufacturing base.

### Model Approaches

**Place-based hubs:** Place-making is an important economic development approach that leverages the value created by co-locating firms, support programs, and/or shared activities such as logistics and back-office functions. Place-based hub models range from supplier parks that create density around a common industry or customer to applied R&D centers that bring together innovation and product development support. Examples include the mHUB product innovation center which connects manufacturers with a community of innovators, entrepreneurs, and engineers to address product development and innovation challenges. Such efforts create a center of gravity for a particular industry that enables efficiency of execution, enhanced industry identity and visibility, and proximity-driven collaboration. But, place-based hubs often require significant momentum to relocate companies and resources, and also carry a significant operational expense obligation.

**Virtual industry organizations:** Virtual networks create institutional platforms for coordination, collaboration, and shared costs. Common virtual industry initiatives include cluster branding and marketing, shared business development activities, and workforce training pathways. RAAN and the Quad City Metal Innovation Hub are two broad ranging virtual industry organization examples that strategically opted to not stand-up a physical facility. Other virtual models – like EWI and many Manufacturing Extension Partnership (MEP) organizations – deliver services not specifically anchored on the co-location of services, programs, and firms. Virtual networks often rely on a member or sponsor-driven business model rather than earned revenue, while virtual service organizations were observed to be more fee and revenue-focused. In virtual networks, actions were noted to often fall on manufacturers, themselves, to advance which leads to one-off programming and organic network building. Virtual service organizations rely more on staff and contract subject matter expertise.

### Applicable Learnings

Key takeaways from the manufacturing intervention analysis include:

- **Deliver immediate, measurable value:** Difficulty engaging firms – which are often resource constrained and have to focus day-to-day intently on their immediate business -- is a major barrier to manufacturing initiative success. Organizations like EWI that deliver specific value that addresses an issue a firm is actively looking to solve generates critical mass of participation of and impact. Awareness, education, and benchmarking activities activate manufacturers, but then there needs to be targeted, measurable benefit.
- **Revenue generation:** Many economic development-focused manufacturing initiatives were found to lack a sustainable business model, particularly initially. Many rely on ongoing sponsorship and other “community good” operational funding approaches which suffer from the ebbs and flows of the economy and partner priorities. As dynamics shift, creating sustainable business models post facto was challenging across researched initiatives. In addition, because economic development initiative funders and manufacturing “customers” may not be the same, a disconnect between activities and direct, measurable business value can exist.
- **Firm benefit over organization building:** Multiple evaluated models built up significant organizations, and often facilities. These overhead requirements were observed to move focus towards organizational sustainability over direct value created for firms.
- **Engage OEMs from the beginning:** Multiple organizations noted the challenges of engaging and garnering funding from OEMs after offerings were already launched. Engaging OEM needs and priorities in initial activities ensures their ROI if they are a targeted customer and participant.
- **Meet firms where they are, at least initially:** Manufacturing initiatives were found to be driven by a select, self-identified group of firms in many cases. Early adopters are inherent with all new activities, but lowering the barrier to entry to engaging busy firms and executives in their own facilities has been a more effective approach for Manufacturing Extension Partnership-led activities and other direct service offerings.
- **Scalability:** Firm-level projects are measurable and impactful, but often not transformational from an economic development perspective. Initiatives with the greatest firm value were often observed to have a small, finite scale. Scalable impact, therefore, requires engaging multiple firms in a single activity and/or developing activities that deliver measurable benefits to single firms which can be applied to multiple firms.

- **Innovation needs a bridge:** The Manufacturing USA and other applied R&D activities are creating new commercializable products. These potential solutions often either remain research projects or are relegated to the largest of firms due to a lack of market feedback and traction with sub-Fortune 500 firms.

## SMI Strategy and Benefits

### Proposed SMI Strategy

A virtual industry organization approach that efficiently delivers defined business value and builds a sustainable, scalable business model is proposed based on model intervention research. Initial activities, manufacturer engagement, and revenue can grow into broader consulting, cluster development, and potentially place-based efforts. SMI can deliver on the identified high-level goals of increased revenue and productivity through two near-term opportunities that arise from an increased focus on supply chain quality, flexibility, and resilience that opens the door for an American manufacturing resurgence:

***Collaborative supply chain development*** – Opportunity exists to capture new supply chains and business attraction targets. Identifying such shared revenue opportunities and assembling competitive supply chains from Southland firms will deliver new contracts and markets.

***Technology-enabled competitiveness*** – Assembling proactive, strategic supply chains can both capture growing markets beyond what individual firms can deliver and also create the business driver and monetary catalyst to invest in enhanced production approaches. ROI-driven, holistic technology integration support and training will enable the right suite of solutions to win immediate business and drive productivity and profitability – at the production worker, firm, and region levels – into the future.

### SMI Benefits

The proposed SMI aims to deliver immediate, measurable digital manufacturing wins through new revenue opportunities. This focus area will deliver tangible benefits to the Southland’s metal manufacturing stakeholders.

#### Southland region

The SMI digital supply chain strategy will invest in, support, and grow existing firms and workers. Envisioned regional economic benefits include:

- Retention and growth of existing firms and employees
- Expansion of regional revenue and tax base
- Improved tax value proposition and counterbalancing of other current regional liabilities
- Attraction of new firms through a defined supply chain value proposition
- Creation of diverse and inclusive economy

#### Original Equipment Manufacturers (OEMs)

SMI seeks to provide a local, capable, and readily accessible supply chains to OEM customers and partners. Envisioned benefits to such large manufacturers include:

- Resilient, cost-effective metal part sourcing
- Reduced procurement time through end-to-end supply chain partnerships
- Improved part quality
- Reduced warehousing and shipping time and cost
- Ability to source specialized parts and capabilities

#### Suppliers

SMI features and offerings center on metal fabrication firms, particularly small and medium enterprises. Envisioned supplier benefits include:

- Increased firm revenue through new supply chain and contract opportunities
- Increased profitability via tailored productivity enhancements and projects
- Greater marketing reach of existing capabilities
- First access to emerging manufacturing technologies and market opportunities

#### Manufacturing support programs

SMI activities will harness the existing wealth of regional support programs through curated, managed, value-driven project integration. Envisioned manufacturing support program benefits include:

- Increased awareness of existing program benefits and impact
- Lowered customer acquisition time and cost
- Enhanced support program participation, fidelity, and outcomes through managed project approach

#### Manufacturing solution providers

SMI productivity activities will help metal manufacturers identify and implement the right suite of solutions for their defined needs and defined supply chain opportunities. Envisioned solution provider benefits include:

- Lowered customer acquisition time and cost
- Increased adoption fidelity
- Improved solution ROI measurement and business case
- Strengthened candid customer feedback

#### Technology and research institutions

SMI will engage regional and national technology and research institutions over time to accelerate commercialization and Southland early-access to emerging manufacturing technologies. Envisioned technology and R&D institution benefits include:

- Accelerated commercial milestones through testbed community for new technologies
- Improved access to seed funding needed to prove and scale new solutions to bridge research and customer revenue streams

## Planned Offerings

SMI will initially focus on supply chain development for new, significant shared revenue opportunities. Projects that increase supply chain competitiveness will be implemented in addition to team building efforts. Core SMI activities will be enabled and expanded through market and local firm capability data insights.

### **Targeted Business Development**

Targeted business development activities will convert relationships, regional capability understanding, and market analysis into tangible Southland firm revenue.

Supply chain opportunity identification: SMI will identify firms across existing NAICS codes, production processes, and industry verticals uncovering unique capabilities and new supply chain opportunities. Two streams of supply chain opportunities are planned for an SMI business development lead. First, OEM-driven supply chain development focused initially on marketing collective Southland supplier capabilities. Local OEM's provide a likely initial market opportunity – as they are well-suited targets for on-demand production and can anchor the growth of regional supply chains (particularly important amidst the current economic crisis). And second, data-driven, targeted outreach will engage OEMs and purchasers in the defined growth markets outlined in the Market Analysis section. OEM-driven supply chain development will likely be a stronger initial use case with a defined revenue opportunity being brought to the table (see golf club reshoring example below). OEMs and large purchasers may have specific products or parts of interest, or SMI may inventory and assess potential supply chain partnership opportunities for them – similar to the Boston Consulting Group's work with Walmart. Both of these channels can be pursued through networking, relationship building, and lead-qualification activities. Market opportunity, competitive capabilities, and other factors will be considered in prioritizing and pursuing specific supply chain opportunities. Ultimately, a technology-enabled marketplace for supply chain partnerships that connects customers with collective Southland capabilities and capacity – potentially in real-time – may be considered to scale new revenue opportunities.

*Example supply chain opportunities:* Walmart vendor networks, DoD mission critical parts, Southland OEMs (e.g., Ford), reshoring opportunity (e.g., golf clubs)

Strategic business partnership development: SMI will facilitate supply chain partnership team building around qualified opportunities through a convening and internal bidding process (when multiple firms with similar capabilities indicate interest). When internal bidding is required, an SMI manufacturing council or its designees would select supply chain team participants. Ultimately, a technology solution that automates evaluation of capability, capacity, quality, and cost would accelerate this process and remove SMI from selection. An SMI business development lead will facilitate the collective bidding process and relationships with the perspective customer unless an obvious and agreed to firm emerges as a bid lead (notionally the highest tier supplier). SMI commission on successful supply chain projects would be commensurate on the level of engagement required in the process.

*Example supply chain partnership:* raw metal supplier, club head forger, club head grinder, heat treatment for forged steel golf club heads

## **Productivity**

An initial focus on targets of opportunity where existing firms and capabilities are competitive will be prioritized to build and test the model. Many opportunities, however, will require enhancements to the prospective team’s capabilities, productivity, workforce, or other factors. It is anticipated that participating in SMI and its particular revenue opportunities will provide focus, incentives and resources to enable firms to address various productivity factors, initially in the context of particular supply chain opportunities. SMI will evaluate these factors and develop a “competitiveness roadmap” that will inform which projects to pursue (cost-benefit-likelihood of success) and feed the productivity offerings described immediately below. Productivity activities will initially focus on creating competitiveness for new supply chain opportunities. Productivity solutions that are applicable, and ideally scalable, across Southland metal manufacturers (e.g., reduced set up for CNC mills) can be expanded to meet larger regional firm demand.

Productivity Projects: Productivity projects are planned to be quick, easy, and affordable activities that connect firms with the right solutions from the universe of the possible for a specific need or opportunity. Projects can address productivity at multiple levels, spanning people, process, technology, materials, and machines, as appropriate. These projects will be holistic in that they integrate in-house and partner solutions and expertise to create an integrated, ROI-driven outcome (versus the current single solution procurement model). SMI will scope and manage productivity projects including recruiting and managing project partners (e.g., the Chicago Defense Resiliency program for cybersecurity certification, Prairie State for workforce training, specific technology vendors, and available funding support programs). SMI will also catalogue and vet startups and solutions, including a focus on local R&D and innovation. For example, the capacity monitoring solution from local startup, Amper, may be included in a competitiveness roadmap to benchmark and optimize shop floor machines for supply chain partnership firms. Each project will have specific milestones, investments, and ROI estimates for the manufacturer.

*Example projects:* Digital sensors to optimize tooling life and machining cycle time, Robotic implementation to decrease setup time, Targeted apprenticeships via local partners to enable relevant upskilling

## **Data and Insights**

Business intelligence, market analysis, and manufacturing capability data can underpin and accelerate the SMI collaborative business development strategy. While initial supply chain partnerships will likely be organic, data-driven market analysis and strategic outreach can create more and larger revenue opportunities as SMI engages more Southland firms and gains deeper insights into collective capabilities and capacity. Initially, capability data will inform early supply chain and productivity project opportunities, while creating a new marketing tool for participating firms. Ultimately, Southland-wide capability data can create a first-of-its kind digital supply chain – essentially positioning Southland MME firms as a production system rather than geographically proximate individual firms. This differentiator would position the Southland as a highly attractive and profitable manufacturing region.

Regional capabilities: Manufacturing capability assessments will be performed to advise manufacturers of their unique capabilities, other industries they could participate in, and new technologies that can increase their productivity and profitability. Assessments will be aggregated over time to create a regional capability model. These assessments are envisioned to be included in SMI membership due to the fundamental importance of obtaining capability data. Capability assessments will be a quick and defined process based

largely on inventorying the machines, software, and other capabilities. Data collected through plant tours and surveys will be analyzed and aggregated. Initially manually, and then ideally through technology-enabled artificial intelligence/automation, SMI project staff will establish what types of products and parts a firm can manufacturer, relevant market opportunities, as well as implementable productivity improvements. Identifying potentially unique capabilities – like the aluminum and magnesium casting capability noted above – will help identify where Southland firms and the region has existing competitive advantages.

*Example assessments:* Part size capability, part material capability, part tolerance capability

Market opportunities: Data is also key to identifying and prioritizing where shared supply chain revenue wins exist for Southland metal firms. SMI can move regional business development from static websites and organic inbound inquires through market analysis that aligns Southland capabilities with targeted business opportunities. An SMI data analyst working collaboratively with other efforts like the Illinois Defense Network will derive new insights from existing databases ranging from import-export tables to defense contract databases to emerging market projections. Qualitative insights on where Southland firms see opportunities can be layered onto these quantitative sources. Opportunities focused on commoditized manufacturing, value-added manufacturing, and emerging markets will be pursued as described above.

## SMI Operations

### Organizational Structure

To deliver on the mission, benefits, and offerings described above, an independent not-for-profit organization is ultimately envisioned to enable the cluster-focused mission and funding flexibility that will position SMI as a core economic development driver. An industry-focused governance board with select civic and government organizations, including local OEMs, MME suppliers, and economic development groups (e.g., SDA), would help ensure grounding in practical and expert industry and market dynamics enables shared regional value creation.

Significant time, effort, and funding is expended initially to launch organizations. Organization building can also shifts focus from value creation to initiative sustainability. Incubating early SMI projects and pilot work in an organization, like SDA, is therefore proposed.

Other organizational models considered:

- Private, for-profit corporation: Because significant subsidy will be required for this work, and considering its the economic development-oriented public good envisioned, SMI may not best align with a for-profit entity, even a B-corporation.
- Host not-for-profit corporation (e.g., within SDA or CMISP): While multiple case studies demonstrate the efficiency of this approach, a dedicated, self-sustaining structure is likely preferable.

### Envisioned SMI Business Model

As noted, SMI is envisioned as a virtual industry organization focused on collaborative market development and shared costs for increasing productivity for MME in the Southland. This approach reflects a shift in



industry organizations from outward facing trade associations<sup>21</sup> to internal industry-facing partnership platforms focused on shared pre-competitive needs (e.g., R&D, shared infrastructure, and workforce development). The described organization focus lends to a business model supported by memberships, project-based fees, and potentially revenue sharing in facilitated supply chain wins. Philanthropic and government support are likely capital sources for early-stage program development and pilot work, along with inclusion, workforce, and other related activities.

### Startup Investment

Seed and scaling funding will be needed to identify initial market opportunities, engage companies, build initial programming, collect the data and capabilities that will drive SMI activities, and then support the tools and infrastructure needed to efficiently replicate and scale SMI projects to address full regional opportunities (e.g., deploying sensor-based optimization tools on all Southland CNC machines along with a systematic training effort for CNC machine operators).

Philanthropic investment is the most likely startup investment source. Potential sources include:

- SDA partners (E.g., MacArthur Foundation, Cook County)
- Manufacturing productivity organizations (E.g., MxD digital manufacturing institute, Illinois Manufacturing Excellence Center, Tooling and Manufacturing Association)
- Local large manufacturers (E.g., Ford, ITW, ArcelorMittal)
- Economic competitiveness initiatives (E.g., Walmart JUMP reshoring initiative, Department of Defense Office of Economic Adjustment)
- Professional services firms seeking to develop reshoring and other manufacturing competitiveness models (e.g., Boston Consulting Group who partnered with Walmart to develop JUMP)

### Membership

SMI is not envisioned to be a focused regional business development and competitiveness effort. Southland firms along with interested OEMs will participate through membership. Membership levels will likely vary from free to a range of monetary contributions depending on the firm size, location, and desired level of participation. All members will commit to participating in capability assessments and certain digital supply chain activities in exchange for the branding, visibility, and proactive marketing and business development they will receive. Membership structure and associated fees should be calibrated against direct business value received.

Prospective members include:

- **OEMs and large suppliers** – Membership for large firms aims to build relationships and partnerships with local suppliers that meet specific product or requirement needs. Multiple membership tiers may be developed for large firms with benefits varying based on level of contribution. Potential benefits include accessing regional assessments and capability insights to understand regional supply chain opportunities, designing specific supply chain partnership projects, and informing digital manufacturing productivity project priorities and development.

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<sup>21</sup> Trade associations have a historically external orientation (i.e., focused on external advocacy and regulatory matters rather than building internal cluster collaboration and competitiveness) and a limited membership base. See “Chicagoland FOOD – Seizing the Opportunity to Grow Chicagoland’s Food Industry” Appendices for more detail.

Analysis identified 20 Southland MME firms with 100 or more employees, a proxy for OEMs and large suppliers. Additional large MME firms are present in the surrounding area. Example potential OEM and large supplier members include: ArcelorMittal, Allied Tube & Conduit, Atkore, Bimba, Ford, Mi-Jack, Whiting.

- **Metal fabricators** – Membership for metal fabrication firms aims to create tangible contracts for manufacturers industries – particularly machine shops – who build to specification for a variety of customers. This subset of Southland metal firms represents the largest number of firms at 122.

All suppliers will participate in the SMI network, including the marketing and visibility generated through the SMI capability assessment. Small and medium manufacturers membership is envisioned to be free or de minimis to maximize participation.

- **Solution and support program providers** – Membership for organizations and companies who seek to support Southland manufacturing and/or sell to or investment in regional firms may be considered. Such members may aim to build awareness and utilization of specific products or programs within SMI’s network of metals firms. Given the proposed neutral SMI role in identifying and delivering competitive supply chain partnerships, intentionality and transparency is needed to ensure that paying members do not receive undue advantages.

Potential membership targets include: Support organizations like IMEC, local startup solution providers like Fast Radius, and digital manufacturing solution providers like PTC and Dassault, consulting companies, and service providers (e.g., law and accounting firms).

### Program Revenue

Direct program execution is envisioned to be on a cost recovery or better basis to ensure business value is being delivered. Incentives and matching funds, like the IMEC innovation voucher and the State of Illinois manufacturing equipment sales tax exemption can be utilized, when appropriate and available, to offset participating firm cost. Pricing and commission rates need to be established through initial case studies to ensure all projects have a measurable return on investment. Program revenue is projected to include:

- Commissions from secured supply chain partnerships paid by participating firms
- A “customer” fee and commissions from OEM initiated supply chain projects seeking specific capabilities and supply chains
- Project-based revenue from productivity projects

### Potential Intellectual Property Monetization

Many regions and organizations pursue business development activities. As outlined above, no models like the one proposed here for targeted, proactive supply chain partnerships were identified. As SMI develops insights, systems, tools and products, there may be a market for its learnings and intellectual property – including the 51 MEP Centers. Over time, a knowledge center revenue generation model may be considered to support new productivity project frameworks. Potential revenue opportunities include:

- Fee-for-service workshops and knowledge sharing

- Licensing of SMI playbooks and productivity project templates

**Budget and Financials**

While building full financials at this point in the concept development and business planning process is premature, the outlines of an illustrative budget follow for discussion purposes. The stated staffing and budget are a starting point for establishing initial SMI resources. It is based on assumptions (which will be tested through the pilot work) regarding the initial SMI scope:

- 1) 25 potential OEMs and large purchasers engaged
- 2) 75 suppliers engaged through capability assessments
- 3) 5 new revenue opportunities pursued
- 4) 25 total productivity projects scoped and managed

Initial Staffing

- **Executive Director** (\$150,000)  
 SMI strategy and partnership development; Organizational management; Community development and coordination with other regional manufacturing stakeholders; Lead supply chain partnership prioritization, team development, and execution
- **Supply Chain Development Lead** (\$100,000)  
 Identify, analyze, and curate new supply chain partnership opportunities; Build relationships with potential supply chain customers
- **Technical Lead** (\$80,000)  
 Perform firm site visits and capability assessments; Scope and source solutions for productivity projects
- **Program Manager** (\$65,000)  
 Manage day-to-day progress of supply chain partnership and productivity projects
- **Data Insights Analyst** (\$75,000)  
 Collective, clean, and analyze market opportunity data including both supply side (regional capabilities) and demand side (customers and markets); Support the development and maintenance of a regional MME production capability model
- **Office and Program Administrator** (\$60,000)  
 Execute day-to-day operational, financial, and administrative tasks; Coordinate marketing, events, and other SMI activities

Estimated Budget by Activity

Expenses	MVP Stage	Roll-Out Stage
<b>Personnel</b>		
<i>Salaries</i>		
Executive Director	\$ 150,000	\$ 150,000
Supply Chain Development Lead	\$ 100,000	\$ 100,000
Technical Lead	\$ 80,000	\$ 80,000
Program Manager		\$ 50,000
Data Insights Analyst		\$ 65,000

Office and Program Administrator		\$ 40,000
<i>Total Salaries</i>	\$ 330,000	\$ 485,000
<i>Fringe and Benefits (40%)</i>	\$ 132,000	\$ 194,000
<b>Total Personnel</b>	<b>\$ 462,000</b>	<b>\$ 679,000</b>
<b>Other Operational Expenses **</b>	<b>**Assumes MVP Stage is hosted at existing organization</b>	
Dues, Fees, Subscriptions	\$ 5,000	\$ 5,000
Office equipment and maintenance	\$ 26,000	\$ 21,000
Marketing/Website	\$ 20,000	\$ 20,000
Internet/Telephone/Utilities	\$ 2,500	\$ 2,500
Travel	\$ 10,000	\$ 10,000
Professional/Contract Services	\$ 100,000	\$ 100,000
Rent (2,000 square feet)		\$ 44,000
Accounting & Audit		\$ 20,000
Insurance		\$ 1,500
<b>Total Other Operational Expenses</b>	<b>\$ 163,500</b>	<b>\$ 224,000</b>
<b>Total Estimated Budget</b>	<b>\$ 625,500</b>	<b>\$ 903,000</b>

Table 2: High-level outline of expenses to build SMI. These are estimates and will vary based on further refinement of the concept paper and subsequent business plan.

### Success Metrics

SMI monitoring and evaluation can track the organization’s progress towards growing Southland MME firm engagement, competitiveness, and revenue growth. The table below highlights proposed key performance indicators and metrics that be used to benchmark and inform SMI activities. Specific targets should be developed collaboratively with the SMI board based on organizational goals and resources, along with the outcome of the proposed pilot activities below. Performance measures can be adjusted as SMI grows and evolves over time.

Key Performance Indicators (Inputs)	Key Performance Metrics (Outputs)
• # of OEMs seeking Southland supply chains	• % improvement/ productivity project
• # of capability assessments performed	• Productivity project ROI
• # of proactive supply chain partnerships development	• # of new supply chain bids won
• # of bids submitted	• New revenue delivered
• # of productivity projects executed	• Jobs retained or created
• # of productivity projects scaled to additional firms	• New businesses attracted
• # of SMI members	• New regional tax revenue

Table 3: Draft KPIs for SMI

## Concept Phasing

### Building the SMI Network

in addition to pilot project and MVP projects, the concept paper can be refined with input from various regional manufacturers and stakeholders (see Table 4). In addition, many on this list can be part of an organizing board to assist in standing up SMI.

Manufacturers	Regional/Manufacturing Stakeholders
ArcelorMittal	SDA
Ford	CSEDC (Reggie Greenwood)
Whiting	Cook County (Irene Sherr)
Mi-Jack	CMISP
Triton (Kyle Edwards, CMISP chair)	CAIC
Ability Engineering (Erik Purkey, CMISP biz dev group)	IMA (Jim Nelson)
Lapham-Hickey	TMA (Steve Kase)
Kocsis Bros	IMEC (Dave Boulay)
Wilson	MxD (Chandra Brown)
Allied Tube	P33 (Brad Henderson)
Kay Manufacturing	DCEO
Chicago Magnesium	
Bonell Mfg	<b>Reshoring</b>
LB Steel	Walmart
Morrison Container	BCG (Justin Rose)
Unistrut	Reshoring Institute (Harry Moser)
Trialco	
Lanco	
Grief Inc	
ITW	
Caterpillar	
Bimba	
Atkore	
Rivian	
Northrop Grumman	

Table 4: A non-exhaustive list of manufacturers and stakeholders in the Southland region who may provide valuable industry insights to inform development of a business plan and potentially be SMI founders.

Input from manufacturers and regional stakeholders can assist in answering the hypotheses and questions listed below.

- **Manufacturing engagement**

- What supply chains and firms are already clustering? Do these existing collaborations provide a starting point for new supply chain development pilots?
- Are general metal fabrication suppliers more interested to engage in supply chain projects than those that are more industry-focused (e.g., automotive)?
- Are the envisioned revenue opportunities sufficient for firms to agree to participate in capability assessments?

- **Business model**

- What value do local OEMs place on strengthening their local supply base? Does that value translate into a “customer” revenue stream for supply chain team efforts?

- Are firms willing to front cost of supply chain teaming and related productivity improvement projects? Is a loan fund like MAGNET created needed?
- What revenue sharing model is most attractive to supply chain teaming activities? Will that influence the types of supply chains – and associated profit margins – that can be pursued?
- What is the market for supply chain teaming and packaged productivity project “products”? How feasible is it to monetize SMI learnings through the Manufacturing Extension Partnership or other channel organizations? What is the financial upside? American manufacturing competitiveness upside?
- **Operational requirements**
  - What is the time, effort, and resourcing required to conduct core SMI activities (e.g., capability assessments, analysis, team building, productivity project scoping and management)? Does this scale linearly?
  - Where can systems, tools, and technology create economies of scale for expanding SMI activity reach and impact? Would soft dollars be available to fund infrastructure development?

### Minimum Viable Product Test

The outlined SMI concept and underlying strategy are driven by the quantitative and qualitative research presented in this document. Additional activities are needed to gain industry-driven feedback and concept refinement. Further manufacturer engagement driven by pilot supply chain building activities are a value-added way to spark participation while generating the learning and data needed to generate a full business plan.

SMI can deliver immediate value while building and testing its business and operational model through a lean startup approach that focuses on optimizing for scale and impact from the beginning. Early investors will support direct revenue and productivity benefits for Southland firms, while this minimum viable approach enables a focus on validating offerings and business and operational models. An MVP also creates real-world data and case study to drive the launch of a full organization and suite of offerings.

MVP pilot activities are envisioned to identify and deliver new supply chain revenue wins. Initial work will preference opportunities and markets where, 1) all of the requisite capabilities exist in the region, and 2) these suppliers are preferably able to deliver high-quality, price-competitive bids without significant productivity or other interventions. Ideal supply chain candidate opportunities will involve multiple metal fabrication processes and present a \$5M+ revenue opportunity.

Candidate opportunities can be sourced from multiple sources. Pursuing Southland and Chicagoland OEMs seeking local, resilient supply chains would deliver immediate engagement and value-add for a key SMI stakeholder group. The Chicagoland-based Reshoring Institute is a potential partner to identify products manufactured overseas that the Southland can recapture (see example project below). And, the Chicago Defense Resiliency Program research and data analytics can provide intelligence on Department of Defense supply chain targets.

### [MVP supply chain partnership approach](#)

A simple four-step process is envisioned for SMI MVP projects (see Appendix C for process diagram; **see Appendix D for example Pilot Project**):

1. **Step 1 – Discover Opportunity** – The revenue opportunity could be with a willing local OEM (i.e. Ford, ITW), the Department of Defense, a reshoring opportunity, or an emerging product/market.

An SMI project lead will identify and qualify leads and prioritize supply chain targets. Multiple data sources would be analyzed such as OEM interviews, trade data, Department of Defense contracting, and emerging market opportunities by the business development lead working with partners such as the Reshoring Institute and the Chicago Defense Resiliency Program. Through outbound marketing (trade shows, personal contact, etc.) SMI will contact each OEM to determine which companies would like to start manufacturing in the USA again. With the help of the OEM, SMI will determine the target price, development time, delivery time, and their current challenges and opportunities. At the MVP phase, SMI will seek out specific capabilities and firms through targeted outreach, plant tours, and surveys to align OEM demand with local ability to deliver.

Deliverable: Revenue Opportunity

Manufacturer Value: Capability Analysis, Regional (Southland Metal Manufacturers) Marketing

2. **Step 2 – Team** – SMI will invite manufacturing firms to a collaborative session to discuss the new revenue opportunity. A technical expert will determine competitive advantage and disadvantages of the region and discover new trade secrets or patents that could be utilized to our advantage. This resource will also determine which companies will make up the new supply chain and what Productivity Projects are needed to be competitive. SMI will work collaboratively with the OEM to ensure SMI meets their cost, time, and quality metrics.

Deliverable: Supply Chain

Manufacturing Value: Revenue Opportunity

3. **Step 3 – Competitiveness Roadmaps** - Initially, MVP projects will likely target teaming opportunities where the resulting supply chain is already competitive. Some support and improvement may be required, though. And higher value, but potentially more involved supply chains can be assembled utilizing the productivity project and other support mechanisms (e.g., cyber security certifications via IMEC or DoD vendor qualification via the Chicago Defense Resiliency Program).

During this step, SMI will scope and execute the “Productivity Projects’ needed to win the new revenue opportunity. Each individual Productivity Project will have its own business case and ROI for the company participating. The increased productivity will not only help win the new revenue opportunity presented but will help the company increase profitability on any other business they do with their current customers. This activity will be used to build our ‘digital supply chain’.

Deliverable: Digital Supply Chain

Manufacturing Value: Increased Productivity & Profitability

4. **Step 4 - Increase Revenue** - This is when SMI will be manufacturing the OEM’s product and realizing revenue. Over time, SMI will also measure community impact – revenue, taxes, crime, unemployment, drugs, housing, poverty, income equality, wealth equality, and inclusion – to gauge our success.

Deliverable: New Revenue

Manufacturing Value: Top Line Revenue, Profits, Prosperity

## Proving the SMI Concept

Building on the 4-step approach outlined for MVP projects, next-phase projects to prove the SMI concept will elicit input from stakeholders, prove the concept, understand capabilities, find revenue opportunities, realize value, and then scale offerings – through the steps outlined below.

1. **Stakeholder Input** – It is difficult to engage manufacturers without providing immediate value for their time. There are a few organizations (TMA, CMISP, CSEDC, CAIC, AIA) that could help recruit manufacturers to listen to a 30-minute breakfast, luncheon, or dinner presentation on the SMI concept. Additionally, there are probably a select number of manufacturers that would participate in an individual session at their facility or a web conference. These organizations may also be positioned to seed pilot activities; for example, TMA has donated almost \$1,000,000 for various capacity building efforts.
2. **Demonstrate Value** – To prove and build out the concept, we must demonstrate stakeholder value with a small pilot project. A willing OEM (Ford, Wilson Sporting Goods, ITW, Boeing, Caterpillar, Department of Defense, etc.) would be needed to ensure manufacturing engagement. National efforts, like the Walmart JUMP reshoring initiative, may also help identify early targets of opportunity. We would utilize the four-step process – Discover Opportunity, Team, Increase Productivity, Increase Revenue – to demonstrate and learn from our pilot.
3. **Understand Capabilities** – Once our concept is proven, we would quickly determine the unique capabilities of our firms and region. This will help identify the specific metal products and markets we should pursue.
4. **Find Revenue Opportunities** – Local corporate relationships, governments entities, and nonprofit organizations would be utilized to help find new supply chain revenue opportunities. The opportunities would be ranked and steadfastly pursued. Based on the capabilities, specific industries or products will be targeted.
5. **Realize Value** – Revenue Opportunities will be transformed into significant value for all stakeholders. Multiple types of products and industries will be pursued, and the best opportunities will be determined.
6. **Scale** – Substantial investments will continue be made to achieve unprecedented profitability and revenue goals until we realize our vision.

## Expanding SMI Core Pillars

A lean concept is proposed for SMI 1.0 to direct time and resources to launching the competitive supply chain team building framework. Additional offerings under the core SMI engagement pillars are envisioned over time. These include:



- **Branding and marketing:** As regional capabilities and unique competitive advantages are understood and developed regional branding, digital marketing, and other narrative development efforts can integrate industry feedback along with new insights on regional capabilities identified through supply chain partnership development and the firm capability assessment activities described below.
- **Awareness and education:** As SMI grows from a supply chain teaming building organization to a more encompassing industry organization, awareness and education activities around productivity solutions can be pursued. Examples include, a mobile factory of the future, Industry 4.0 workshops, and potentially a physical demonstration hub.
- **Funding programs:** Productivity offerings are planned to be self-funded given the intentional focus on fast, easy, and measurable ROI outcomes. Some organizations – like MAGNET in Ohio – have found that creating a loan fund helps de-risk participation by eliminating the need for upfront capital. Such a fund may be considered, as demand dictates.
- **Innovation bridge:** Establish a test bed and matchmaking program to accelerate commercialization and adoption of new manufacturing solutions. This offering would create customer feedback mechanism, pilot opportunities, and customer pipelines for emerging technologies and startups (e.g., Fast Radius and Amper). A commercialization fund could be considered to help startups reach defined commercial milestones that make them viable to Southland customers. Equity investment is increasingly common in the nonprofit community and could be monetized to exponentially support and grow SMI offerings.

## SMI Growth Potential

In addition, new SMI engagement areas may be pursued as the building blocks for the Southland’s digital supply chain form. Alternatively, the collaboration and clustering enabled directly through SMI may spark new initiatives housed under a shared nonprofit holding entity. Specific growth areas include:

- **Physical productivity hub:** Leverage virtual organization success to build out and support a physical productivity hub. Potential activities could include process and product development, along with training and capacity building. One specific concept could be a DOD supply chain resilience qualification center that addressed the vendor qualification, capability, and innovation bottlenecks to sourcing single source and mission critical parts as outlined in the 2018 White House report cited above. Such a DOD hub would further accelerate SMI defense supply chain development efforts.
- **Inclusive Workforce systems development:** Lead an alignment of existing workforce activities to promote coherence and collaboration that establishes full training pathways that lead to needed skills for high-quality, resilient jobs. This system also would establish a platform to accelerate skill development and credentialing for new advancement manufacturing techniques and jobs. Opportunities for high-wage careers in emerging digital manufacturing occupations will require technical competencies in advanced manufacturing (including the categories listed below)<sup>22</sup> - and, many more specific skills will be identified depending on regional MME employer demand.

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<sup>22</sup> Advanced manufacturing competencies: <https://www.careeronestop.org/CompetencyModel/competency-models/advanced-manufacturing.aspx>. More traditional MME occupations are outlined in Table 1, and their associated skills can be approximated on O\*Net OnLine ([www.onetonline.org](http://www.onetonline.org)).

- Manufacturing process design/development
- Operations management
- Maintenance, installation and repair
- Production in the supply chain/ supply chain logistics
- Quality assurance & Continuous improvement
- Process & Equipment Health Safety, and Environment
- **Enabling manufacturing environment initiatives:** SMI success can enable and potentially necessitate investments and initiatives that support the nascent digital supply chain. A shared voice across Southland firms can serve to align and mobilize support for such priorities. For example, accelerated deployment of 5G or “low power wide area network (LPWAN)” infrastructure may be required to better connect manufacturing suppliers and customers with real-time data. An applied R&D partnership network to address shared production needs is another potential opportunity.

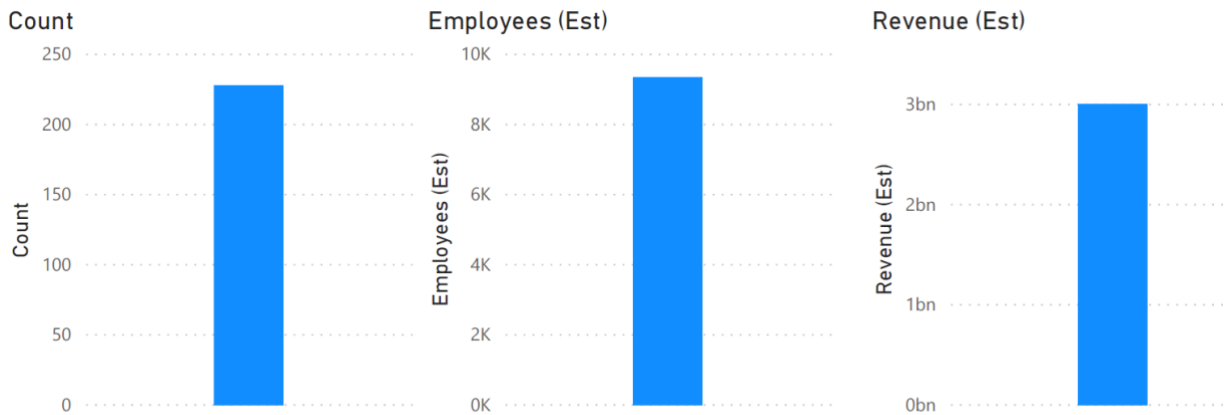
## Conclusion

The Southland has considerable MME assets to build from. Changing manufacturing production and economic dynamics create the opportunity for the region to further enable and capture this potential to increase the revenue, productivity, and profitability of its firms as part of the SSEGI inclusive economic growth strategy. SMI can spark the engagement and partnership needed to realize this potential by delivering shared revenue wins that promote investments in technology and upskilling. Creating an integrated, efficient, and accessible metal fabrication system will establish a global position and brand that can additionally serve as an equally powerful business attraction tool. Success will lift up a struggling region by strengthening existing Southland manufacturers and establishing a marketable competitive advantage that attracts new firms.

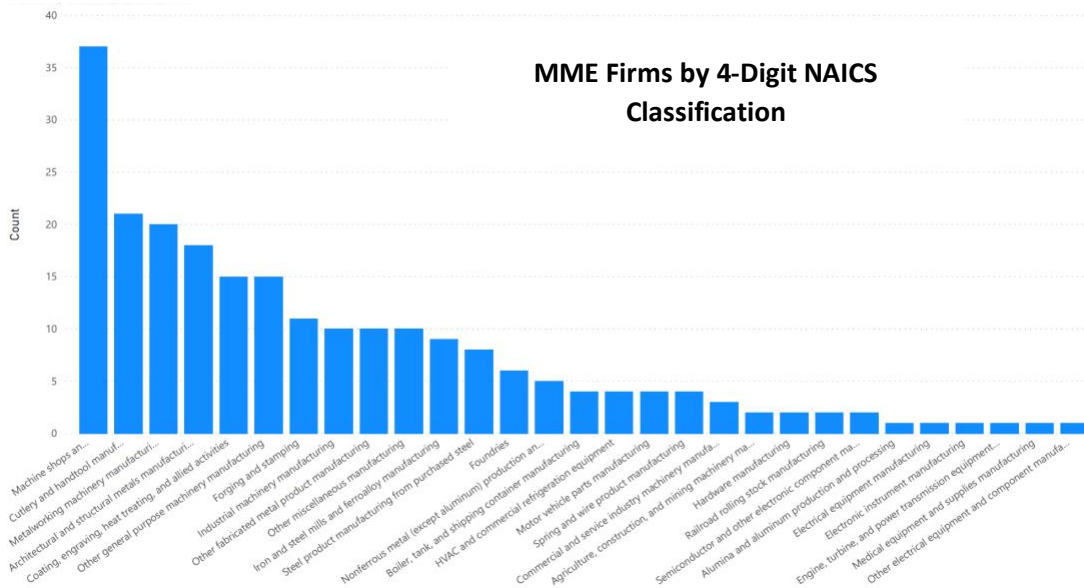
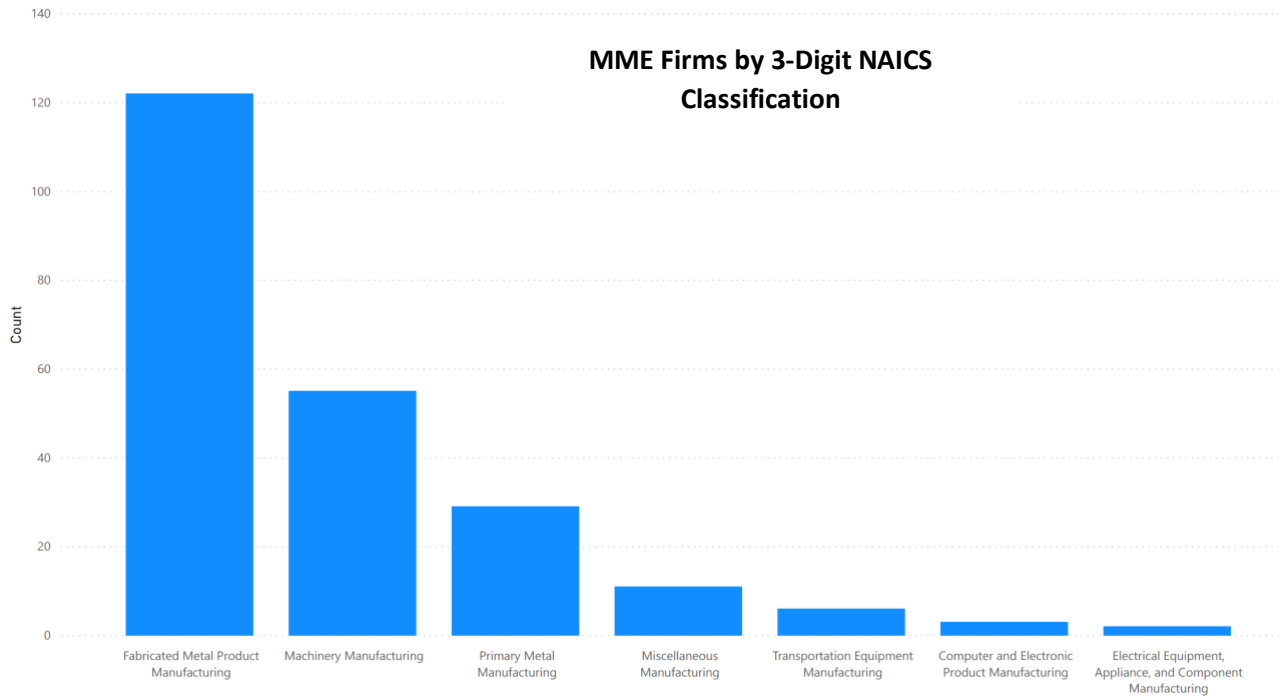
## Appendix A – Southland Region Analysis

MME firm data and outputs were assessed to understand the presence and impact of metal manufacturing on the SSEGI-defined geographic region. NAICS codes 331-333 were analyzed. Dunn & Bradstreet, NETS, InfoGroup, and the local databases from the Calumet Manufacturing Industry Sector Partnership (“CMISP”) and the Chicago Defense Resiliency Program were used to initially identify 531 MME firms. Due to limitations of NAICS classification, additional analysis and data cleaning across these data sets was performed to provide a deeper look at Southland MME firms. 228 MME firms remained after the balance were discarded due to inactivity, change in location, or business activities that were not related to metal manufacturing (e.g., locksmiths). The breadth of the remaining firms reveals a strong starting point for production of parts for multiple MME horizontal and vertical supply chains. Geographic Information System (GIS) mapping of Southland MME firms demonstrated densities of manufacturers correlated to railroad lines. Revenue and employee figures were established using Dunn & Bradstreet data and reflect a conservative but significant estimate, offering an initial understanding of regional capabilities and outputs.

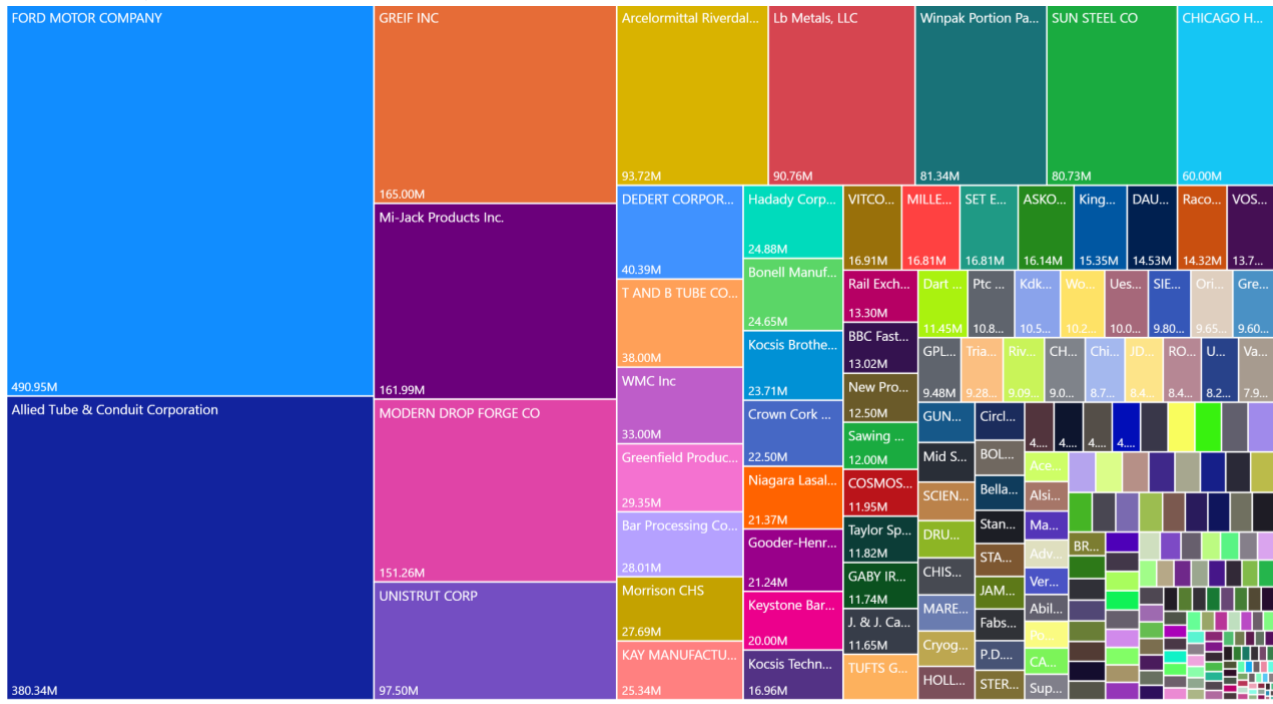
### Southland MME Firm Economic Impact



MME Firms by 3- & 4-Digit NAICS Classification



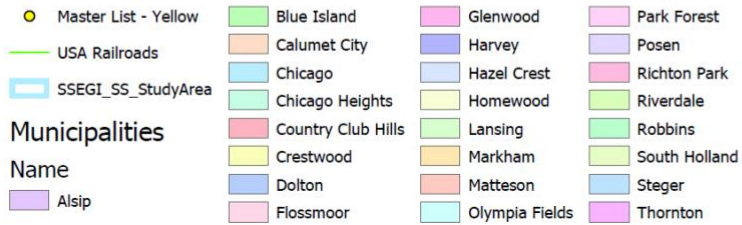
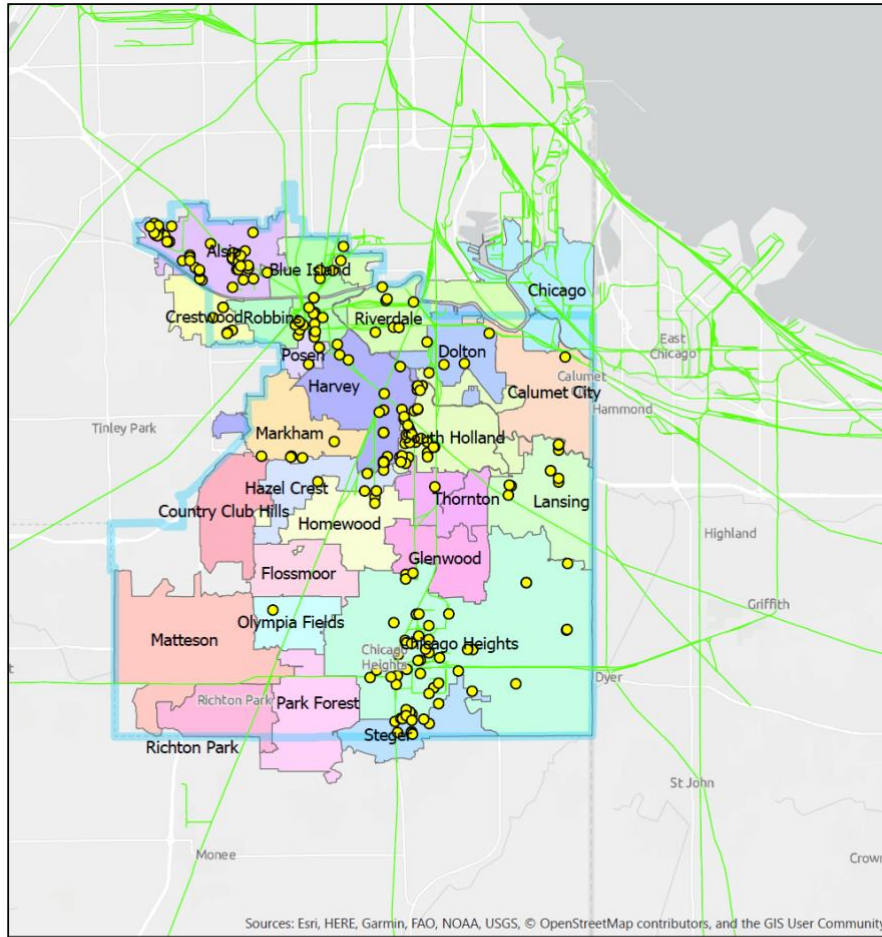
Revenue by Firm



Employment by Firm



Southland MME Firm Location



Southland MME Support Ecosystem

<b>Primary Metals</b>  <b>29 Firms</b>	<b>Fabricated Metals</b>  <b>122 Firms</b>	<b>Machinery Mfg</b>  <b>55 Firms</b>	<b>Misc Mfg</b>  <b>11 Firms</b>	<b>Transportation Equipment</b>  <b>6 Firms</b>	<b>Digital Assets</b> Argonne ALCF Digital Capability Center NCSA Urbancom Fiber 5G Providers
			<b>Computer/ Electronic</b>  <b>3 Firms</b>	<b>Computer/ Electronic</b>  <b>2 Firms</b>	
<b>Workforce</b>	Governors State IMA Ed Foundation K-12 Moraine Valley Prairie State South Suburban SouthWorks TMA	<b>EDO/ Biz Dev</b>	CAIC Chicago Defense Resiliency Program CMISP Cook County DCEO Intersect Illinois P33 SBDC Southland EDC SSEGI/SDA SSMMA WBC	<b>Innovation</b>	Argonne IIT mHUB MxD NIU Northwestern UI System UChicago
<b>Biz/Ops</b>	Illinois BIS IMEC TMA			<b>Capital</b>	Banks Risk Capital (VC, PE) Grant/Loan Programs

Appendix B – Manufacturing Growth Models and Initiatives

	Initiative	Industry Development	Productivity	Product/Market/Revenue
Virtual <i>*Southland based</i>	Calumet Area Industrial Commission*	X	X	X
	Calumet Manufacturing Industry Sector Partnership*	X	X	X
	Central Indiana Corporate Partnership/CONEXUS	X	X	
	Digital Technology Adoption Pilot Program (Canada)		X	
	Greater Peoria Manufacturing Network			X
	Illinois Manufacturing Excellence Center*		X	X
	MAGNET (Ohio)		X	X
	Quad City Metal Innovation Hub	X	X	X
	Rockford Area Aerospace Network	X	X	X
	Illinois BIS*		X	X
	Technology and Manufacturing Association*	X	X	X

Physical	EWI		X	X
	Automation Alley	X	X	X
	Buffalo Manufacturing Works		X	X
	Clemson University International Center for Automotive Research (CU-ICAR)	X		X
	Commonwealth Center for Advanced Manufacturing		X	X
	McKinsey Digital Capability Center		X	
	mHUB			X
	Michigan Manufacturing Technology Center		X	X
	National Defense Center for Manufacturing and Machining		X	X
	Technology Development Institute (Kansas State)			X

**Select Model Descriptions**

*NOTE: The "Program Descriptions" listed below are excerpts from program websites. The "Learnings" that follow are the team's observations and commentary.*

**Automation Alley**

Program description: Automation Alley is Michigan's Industry 4.0 knowledge center, with a global outlook and a regional focus. Our programs give companies a competitive advantage by helping them along every



step of their digital transformation journey. We obsess over disruptive technologies like AI, the Internet of Things and automation, and work hard to make these complex concepts easier for companies to understand and implement. As a nonprofit technology and manufacturing business association, we connect industry, academia and government to fuel Michigan's economy and accelerate innovation.

### *Technology Sectors*

Automation Alley, Michigan's Industry 4.0 knowledge center, identifies Industry 4.0 as a collection of eight emerging technology sectors, all of which require new ways of thinking and working:

- **Additive Manufacturing & Advanced Materials** - Additive Manufacturing is the construction of complex three-dimensional parts from 3D digital model data by depositing successive layers of material. Advanced Materials focuses on new materials and modifications to existing materials to obtain superior performance in one or more characteristics that are critical for the application under consideration. They can also exhibit completely novel properties.
- **Artificial Intelligence** - The simulation of human intelligence processes by machines, especially computer systems. These processes include learning (the acquisition of information and rules for using the information), reasoning (using rules to reach approximate or definite conclusions) and self-correction.
- **Big Data** - Extremely large data sets that may be analyzed computationally to reveal patterns, trends, and associations.
- **Cloud Computing** - Shared pools of configurable computer system resources and higher-level services that can be rapidly provisioned with minimal management effort, often over the Internet. Cloud computing relies on sharing of resources to achieve coherence and economies of scale, similar to a public utility.
- **Cybersecurity** - The protection of computer systems from theft or damage to their hardware, software or electronic data, as well as from disruption or misdirection of the services they provide.
- **Modeling, Simulation, Visualization and Immersion** – A set of technologies used in the design, analysis, verification and validation on a product to improve quality, processes, training techniques and situational preparedness.
- **Robotics** - Mechanical or electrical engineering coupled with computer science used to design, construct, operate and apply robots, including the computer systems for their control, sensory feedback and information processing.
- **The Industrial Internet of Things** - The use of Internet of things technologies to enhance manufacturing and industrial processes, incorporating machine learning and big data technologies to harness the sensor data, machine-to-machine communication and automation technologies that have existed in industrial settings for years.

Learnings: Founded in 1999; operates with mix of soft and program revenue. Tiered membership ranges from \$750 to \$5,000 per year depending on firm type and size. Raising an endowment fund to support operations. In 2017, total revenue was ~\$5M with about 20% coming from program revenue. The balance was from contributions. Membership includes access to space, center expertise, and participation in special initiatives and programs. Membership fees range from \$750 per year for small firms to \$5,000 per year for corporations. Foundation memberships target companies with large Michigan presence and experience with Industry 4.0.

Automation Alley is thought leadership driven. It created Industry 4.0 vision for the State of Michigan that aligns partners and guides activities.

Service offerings and initiatives:

- Industry 4.0 assessment
- The Center has implemented various Industry 4.0 technologies to create a "Real Factory 4.0"
- Supplier Industry 4.0 upskilling activities
- Defense manufacturing programs, including reverse engineering and DOD/DOD contractor matchmaking. Focus on relationship building for firms.

### **Calumet Area Industrial Coalition**

Program description: The CAIC mission is to lead the industrial expansion and retention efforts in metropolitan Chicago and Northwestern Indiana. To fulfill its mission, its programs and service are focused on the following areas. Industrial Advocacy, including linking companies to Economic Development Resources. Networking and business form events include quarterly luncheons and social outings. Workforce training and education initiatives include WIOA Job Placement and WIOA On-the-Job Training. Apprenticeships are a current CAIC focus, with 10 companies participating in a program centered on industrial maintenance and computer numerical control (CNC).

CAIC is a member-based initiative. A main CAIC proposition is the convening and coordinating capability of this group. Members can also access a range of benefits including help navigating government programs, warm referrals and business leads, and networking opportunities. It is unclear how utilized these offerings are and the measurable value they create.

CAIC is housed within the Chicago Cook Workforce Partnership, a non-profit agency created by Chicago then-Mayor Rahm Emanuel and Cook County Board President Toni Preckwinkle. The Partnership administers federal and private funding to a network of more than 50 delegate agencies, including 10 American Job Centers. In collaboration with The Partnership, these agencies promote comprehensive workforce development initiatives addressing the training and career placement needs of jobseekers and businesses and economic growth throughout Chicago and Cook County.

### **Calumet Manufacturing Industry Sector Partnership (CMISP)**

Program description: The Calumet Manufacturing Industry Sector Partnership (CMISP) is a network of over 30 manufacturing businesses in the Calumet region. Manufacturing-Led: Small family-owned and operated manufacturing businesses to large multinational manufacturing firms are coming together to solve common problems. Businesses identify common opportunities, define, and execute an action agenda for strengthening the industry. Community-Supported: The partnership was launched in November 2017 with the support of seven community and government organizations committed to supporting the coordination and implementation of the Partnership's priorities. The organizations involved are the Calumet Area Industrial Commission, Chicago Cook Workforce Partnership, Chicago Federation of Labor Workforce and Community Initiative, Chicago Metro Metal Consortium, Chicago Southland Economic Development Corporation, Cook County Bureau of Economic Development, IMEC, and OAI, Inc.

Learnings: CMISP is staffed by and housed in Cook County government. One resource organizes CMISP activities. Volunteer support from manufacturing executives support strategic initiatives such as the business networking group and the workforce working group. Benefits are created through relationship building and knowledge extension. Participation in CMISP by economic development and manufacturing support organizations has been strongest. Dedicated resources and subject matter expertise would help to drive traction for efforts like a regional supplier database.

## **EWI**

Program description: EWI empowers industry leaders to overcome complex manufacturing challenges and seamlessly integrate new processes to bring products to market more quickly and efficiently. With unmatched expertise and advanced manufacturing technology resources, EWI is an integral extension of our clients' innovation and R&D teams. We can assist you at any stage in your process—or collaborate with you from start to finish.

Learnings: Fee-for-service revenue model; limited to no recorded grants and contributions.

Three facilities: EWI-Ohio, Buffalo Works, & EWI-Colorado

General services lines and expertise and site-specific focus areas

- Welding
- Additive Manufacturing
- Metrology

Translatable service offerings. Good case studies are available for different services and capability types.

- Shift program is a free program that helps SMEs identify and implement advanced manufacturing solutions
- Rapid Feasibility Service enables customers to expedite testing process screening trials through a single-rate day service
- Advisory services build subject matter teams around design and operations challenges including automation process development

## **Greater Peoria Manufacturing Network**

Program description: The Greater Peoria Manufacturing Network was launched through an EDA grant by the Greater Peoria Economic Development Council to establish nimble eco-system of companies that offers a collective solution, with a single point of contact to help you navigate your entire project – from design and fabrication to consulting and logistics.

Learnings: The Network was funded through EDA and local philanthropic funds totaling about \$450K. About a dozen firms currently participate. Roadshows and other business development activities focused on the heavy machinery and defense industries have been utilized to seek new contract opportunities. To-date, two contracts have been secured, with a handful of others in discussions. A new digital marketing partnership with IMEC will target 1,500 potential customers within a 250 miles radius.

## **Illinois BIS**

Program description: Illinois BIS' mission is to provide exceptional consulting and training to help our customers grow. It specializes in companywide strategic business improvement solutions that result in bottom-line profitability.

Illinois BIS delivers workforce development training for companies in the Chicagoland region, offering a wide range of programs such as Lean, Six Sigma, and other technical skills. Through a partnership with the Chicagoland Chamber of Commerce funded by Illinois Employer Training Investment Program (ETIP) eligible companies may be reimbursed for up to 50% of the training costs. Illinois BIS, with its partner Sunstream EDI, states it offers a complete product development solution, or can provide consulting services for engineering projects. Offerings range from engineering design of new products, proficiency in a particular discipline or multiple disciplines and include:

#### Engineering Service Options

- Limited - may include design reviews, GD&T reviews, engineering analysis, manufacturing process reviews, cost reduction, or troubleshooting, with a simple NDA.
- Extensive - may include product development from conceptualization to production-ready design, with an exclusive NDA arrangement with you and no other competitors working as a partner with your Engineering team.

#### Areas of Expertise

- Mechatronics
- Fluid Power Engineering
- Electronics Design
- Mechanical Design
- Controller Design and Dynamic Analysis
- Embedded Software Design
- Windows based HMI/GUI Design
- Manufacturing Process Design

Learnings: Illinois BIS was spun out of the University of Illinois a few years ago. As a standalone nonprofit it generated \$2.7M in revenue in FY2018, with about 75% from earned program revenue. The remainder largely being contributions.

### **Illinois Manufacturing Excellence Center**

Program description: IMEC is the State of Illinois NIST Manufacturing Extension Partner. Through a team of improvement specialists and technicians – largely contractors – IMEC provides consulting services and training in the areas of Leadership, Strategy, Customer Engagement, Operations, and Workforce. It operates through a matching fund model where federal dollars subsidize manufacturers costs 1:1.

IMEC reports a return on investment that exceeds 19:1. This is made possible as organizations become more effective and efficient. As a federal MEP-partner, it is measured by the number of participating companies and the level of matching funding generated. These metrics can create a fine balance between highly scalable offerings and optimized business value delivered.

IMEC has an annual budget of around \$10M. With more than 50 full-time staff and partners positioned statewide, IMEC delivers the local expertise to not only plan and strategize, but to implement and evaluate

the effectiveness of client improvements. In fact, IMEC assists more than 700 companies each year with successful business improvement projects. IMEC has a dedicated resource for the Southland focused mainly on business development. It is partner to multiple manufacturing initiatives, including CMISP.

Learnings: Technology services is one IMEC consulting engagement focus. Using the process developed by the Research Triangle Institute International (RTI), IMEC searches outside traditional channels to find solutions for unmet technology needs. Sourcing interested firms is labor intensive and project fidelity and completion can be barriers to scaling. A new “manufacturing innovation voucher” funded by IMEC reserves was recently launched to subsidize the consulting component of technology projects. \$25,000 matching grants are currently being scoped and executed with the goal of 50 projects in one year.

## **MAGNET**

MAGNET is the MEP for Northeastern Ohio. MAGNET helps small and mid-size manufacturers grow with our expert consulting services backed by our partner network of leading manufacturing companies. It generated \$8.2M in revenue in 2016 with about 25% from program revenue and the balance from contributions – largely the federal NIST MEP grant.

MAGNET manufacturing experts have helped over 2,000 manufacturers generate an additional \$1 billion in sales, realize more than \$400 million in cost savings, and create or retain 11,000 jobs in Northeast Ohio. Contractors and partners, such as NASA, provide technical expertise.

MAGNET activities focus on:

- Sales and Marketing
- Product Design and Development
- Cyber
- Process Innovation
- Quality
- Engagement and Operations

Learnings:

- Focuses on holistic solutions to manufacturer requirements and challenges. Emphasis on meeting client where they are and tailoring a solution. Limited “off the shelf” offerings.
- Partner development and project scoping is a big value-add. It’s not enough to match firms to a partner, but the engagement must be defined and managed.
- Created innovative financing mechanisms to help de-risk project participation.
- Technology projects are only considered once a firm is otherwise operationally efficient.
- Scales via network of contractors and subject matter experts.
- All projects have an ROI; but this sometimes requires eating cost if time estimates are incorrect.
- Pay for performance program offers delayed payment terms to backload fees until after project value is realized.

## **Michigan Manufacturing Technology Center**

Program description: Personalized consulting services that enable Michigan manufacturers to work smarter, compete and prosper. We develop more effective business leaders, drive product and process

innovation, promote company-wide operational excellence and foster creative strategies for business growth and greater profitability.

### Learnings

Five regional centers as the Michigan MEP network. Traditional MEP serving a broad range of industries through offerings around operational efficiency, business development, quality, and workforce development.

### Related Services:

- **Market Research:** Houses a Research Services Team that helps companies make data-driven decisions using quantitative and qualitative information. Support areas include industry and market trends, supplier evaluation, and insights on perceptions and awareness of a client's capabilities.
- **Advanced Technology:** The Center helps companies learn to utilize advanced manufacturing tools to gain insights on strategies and investments. Targeted outcomes include increased sales and profitability, new product development, and new market access.

### Industry 4.0 offering vertical:

- Real Factory 4.0 – see technologies integration and inaction, including cobots, M&S, additive, and IIoT sensors and data analytics
- Opportunity assessment
- Personalized firm report and project plan

### **National Defense Center for Manufacturing and Machining**

Program description: Founded in 2003 to drive innovation throughout the defense manufacturing industry. Four sites operated solely on contributions and grants (\$43M in FY16 with member ~\$7M and government grants ~\$36M – largely passthrough)

### Direct service lines (also manage federal programs like AmericaMakes)

- Manufacturing engineering services
- Design engineering services that help firms meet customer requirements
- Assessments of operations and other business practices
- Supply chain management that enables greater control and efficiency of complex enterprise supply networks

### Technical focus areas

- Additive manufacturing
- Automation
- Conventional machining
- Inspection, Testing & QA
- Environmental sustainability

### **Purdue MEP**

Program description: Our mission is to advance economic prosperity, health and quality of life in Indiana and beyond. Our mission is brought to life in the work we do for our clients every single day.

We accomplish this through the following:

- Enhancing the competitiveness of Indiana manufacturers through an expanded focus to include small, rural, and emergent manufacturers and new services that lead to top-line growth as well as bottom-line savings.
- Championing the manufacturing industry by communicating its positive impacts on industry and workforce to all interested parties, as well as continued participation in events that highlight the successes of Indiana manufacturing.
- Supporting partnerships to leverage available resources, programs and leaders across the state to emphasize the manufacturing sector as an economic engine.
- Developing capabilities in line with Indiana manufacturing priorities, including an increased capacity to deliver innovation and growth services to small and medium-sized manufacturers.

Service lines:

- Continuous improvement (Innovation, Lean, Leadership, Quality, Six Sigma, Supply Chain)
- Growth (Competitiveness review, Faculty assistance, Training)
- Innovation & Tech (Additive consulting, Cobot Site Eval, Cyber, Digital & Design Assessments, Tech & Productivity Solutions)
- Assessments (How Lean?, How does your QMS Stack up?, Are you ready to export?)

Learnings:

Technical Assistance Program (TAP) provides up to 40 hours of faculty time per year to Indiana businesses IN-MaC provides grant-funded assistance from university experts to help manufacturers incorporate new competitive technologies (3-6 mo. Projects)

- Digital engineering for product design, including computational fluid dynamics, FEA, materials analysis
- Product lifecycle management, including model-based engineering, supply chain integration, and 3D modeling.
- Production systems modeling and design, including factory flow optimization and line simulations

Undertaking a \$1.7M project to engage regional manufacturers. Interviews and assessments are being used to identify the production capabilities of each firm.

### **Quad City Metal Innovation Hub**

Program description: The Quad City Metal Innovation Hub was launched by the Quad City Chamber of Commerce in an effort to strengthen and diversify the metal manufacturing supply chain in the bi-state region. It was funded through DoD grant money and was staffed initial by executives on-loan to the Chamber.

The Quad Cities Manufacturing Innovation Hub is a mega resource designed to help manufacturers and others in the defense supply chain identify opportunities to grow and differentiate their operations,

products and services. Through the Hub, companies can create local, national, and international awareness of their capabilities; build on strengths and leverage new technologies; and gain a competitive edge in the marketplace.

Overall Services:

- Operational assessments (where Hub facilitators tour your facility, administer a questionnaire and meet with your team)
- Registration in the [Quad Cities Regional Capabilities Catalog](#) helps increase visibility
- Industry-specific events that provide manufacturers the opportunity to meet with potential new customers and/or suppliers, share information and samples, and more
- Training and seminars
- Identification of potential business development and/or partnership opportunities with the Supply Chain Mapping Tool
- Access to the [Critical Talent Network](#)
- Connections to the [Quad City Manufacturing Lab](#) and [MxD](#) in Chicago
- Access to eight [technology playbooks](#), or “how-to” guides, that help manufacturers understand the industry landscape and current technologies, share best practices, identify opportunities, and build a business case

Learnings: The Hub has pursued technology adoption initiatives in multiple ways. Robotics and automation, 3D printing, AR/VR, and CAD/CAM have received the most interest. Regular “101” workshops highlight current technology trends. IMEC performed digital assessments. Tech Playbooks aim to provide curated resources and expertise focus on specific technologies to aid implementation. Adoption has been like “pushing on rope.”

New revenue pursuits are another focus through DOD funding. 20 different companies have been involved in the Defense Supply Chain Mapping Tool. A new data research position was created this past year to identify gaps in supply chains. OEMs are currently being engaged to try to sustain current activities.

### **Rockford Area Aerospace Network**

Program description: The Rockford Area Aerospace Network (RAAN) is a consortium of companies implementing a strategic plan to increase the competitiveness of the Rockford Region for aerospace expansion and attraction. The Rockford Area Aerospace Network (RAAN) was created as a consortium of companies implementing this plan. Initiatives include:

- A virtual supply chain search that utilizes self-annotated firm capabilities and certifications
- Annual aerospace symposium
- Joint business development and trade efforts such as the Paris Air Show
- Shared activities including workforce training, innovation, and business matchmaking

Learnings: Rockford and NIU utilized an EDA cluster grant to identify aerospace as their go-forward manufacturing focus and develop a strategy to bolster this cluster. RAAN is a virtual network embedded in the Rockford Area Economic Development Council that leverages the EIGERlab innovation center in Rockford. It is led by an elected chairman from industry and is staffed by the RAEDC. It was launched to galvanize and grow the 250+ aerospace and aviation firms in the region. RAAN served to create a shared



identity, regional marketing, and business development platform. Workforce development across skill-levels has become a collaborative focus. Shared talent efforts include the JiET-A engineering program, 2+2 credential from Rock Valley College and NIU-Rockford, and 8-week employer-driven Techworks rapid training program.

### **Technology and Manufacturing Association**

Program description: Representing close to 1,000 manufacturers and over 30,000 manufacturing employees, the Technology & Manufacturing Association (TMA) is a comprehensive resource for Midwest manufacturers looking to improve operations, strengthen their workforce, and grow their businesses. As a leading voice in an evolving industry TMA cultivates and strengthens our members by providing them programs and services in order to thrive as individuals, companies, and a business community.

TMA provides members access to an exclusive, online network of 650+ manufacturers that share ideas, develop solutions, solve problems, and shop jobs. TMA also assists members in increasing productivity with rapid access to tools, capabilities and services through its alliance with IMEC.

TMA Members range in size from one-person sole proprietorships to large multi-plant corporations:

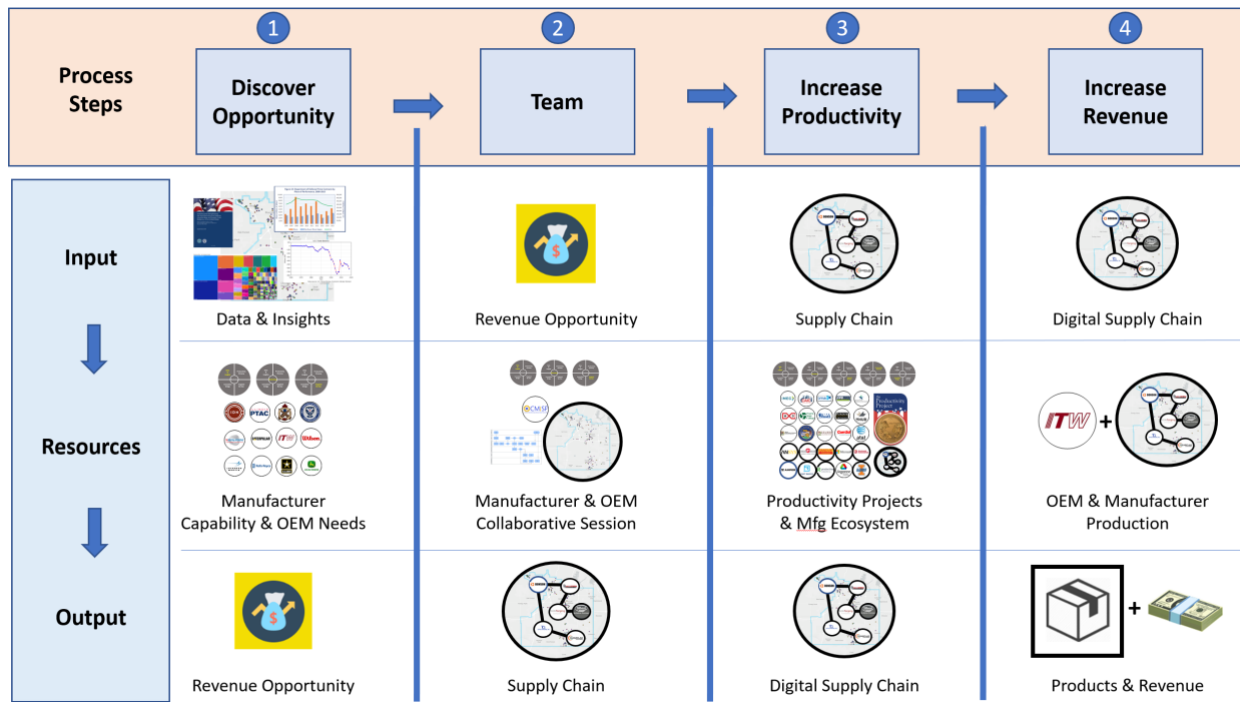
- Regular Members: Regular members are direct manufacturers who make and distribute parts and products. Among other companies, they include contract and Original Equipment Manufacturing (OEM) companies, including allied service providers such as heat treating, plating, polishing, painting, and finishing
- Associate Members: Any firm engaged in the business of providing services, equipment, machinery, or materials unique to companies that qualify as a TMA Regular Member and of a nature not normally performed by TMA Regular Members is eligible for Associate Membership in the Association. Normally, the applicant is engaged primarily in warehousing, sales, and distribution, rather than in any manufacturing phase of metalworking or metal treatment.
- Affiliate Members: Any proprietorship, partnership, or corporation engaged in the business of providing services, equipment, or material to companies that qualify as TMA Regular Members and of a nature performed neither by TMA Regular nor Associate Members, is eligible for Affiliate Membership in the Association.

### Learnings:

TMA generates around \$2.5M annually, largely from program revenue including training programs. Members access a range of services including professional services (marketing, shipping, payroll) to professional development.

TMA Education Foundation has donated over \$950,000.00 in machinery, software, equipment, awards, competitions, instructors, research, credentialing and scholarships. Through a shared mission, TMA Education Foundation and TMA work together to support manufacturing through technical education programs, outreach and promotion of manufacturing careers. TMA supports the foundation to be successful in a variety of ways that includes, but not limited to staff support.

## Appendix C – SMI Competitive Supply Chain Building Approach



## Appendix D – Example Pilot Project

**Metal Golf Club reshoring:** Golf club manufacturing offers an example supply chain opportunity. The Chicago area was once known for golf club manufacturing; more golf clubs were made around Chicago than any other place in the world<sup>23</sup>. The area lost that reputation nearly thirty years ago, but much of the manufacturing capability remains. Manufactured from steel, golf club manufacturing would involve multiple manufacturing processes and represents a multi-million-dollar opportunity for the region. Improvements to the manually intensive finishing steps, such as grinding of the club heads, will likely be needed to deliver a cost-competitive product. Additional competitive advantages that enable mass customization, increased performance, and other benefits beyond bottom-line cost can also be explored.

### Step 1 - Discover Opportunity

For a Reshoring project like golf club manufacturing, SMI will first analyze the current trade data. Total revenue opportunity, annual trade deficits, ports of entry, tariffs, export companies, import companies, travel times, travel costs, manufacturing processes needed, and the targeted OEMs for reshoring will be determined. This analysis can determine if and what golf club segment to pursue, e.g., mass-produced steel clubs versus high-end clubs like the PXG forged irons that have very thin faces and computer-milled heads with cavities filled with a thermoplastic. Through outbound marketing (trade shows, personal contact, etc.) large golf club companies will be contacted to determine which companies would like to bring manufacturing back to the USA. With the help of the OEM, SMI will determine the target price, development time, delivery time, and their current challenges and opportunities. Total cost of ownership analysis will determine the true reshoring cost delta, if any. Integrated supply chain partnerships will likely introduce cost and fulfillment efficiency. Additional cost and quality competitiveness needs (e.g., more efficient club head grinding) and the associated process and technology improvements solutions will be determined, as appropriate.

For this example, assume that Wilson Sporting Goods, located in Chicago, desires to manufacturing their golf clubs in the USA.

Deliverable: Wilson Sporting Goods \$8M Revenue Opportunity

### Step 2 – Team

Golf club manufacturing requires multiple manufacturing processes such as forging, casting, machining, grinding, polishing, and electroplating. After analyzing the capabilities of the region, SMI will invite specific manufacturers to a collaborative session to determine regional competitiveness and if the Southland has any unique capabilities that will provide us with an advantage. Perhaps, a new material developed at QuesTek Innovation or a simulation model utilizing Argonne’s Advanced Leadership Computing Facility could provide a new value above and beyond the current cost and quality. Or, additive manufacturing of a club head through the support of a firm like Chicago-based Fast Radius may introduce performance beyond what the current forging process delivers. SMI analysis may also reveal processes (i.e. grinding) that need to be automated or opportunities to significantly increase the productivity of the forging or machining process. During the session, exact “Productivity Projects” that would need to be completed in order to

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<sup>23</sup> [Northwestern Golf Company: Golf Clubs for the Masses. Chicago Golf Report. July 10, 2016](#)

start manufacturing golf clubs in the region will be determined.

Deliverable: Golf Club Supply Chain Manufacturers, Competitive Analysis, Productivity Project List

Step 3 - Increase Productivity

During this step, SMI will execute multiple “Productivity Projects” that will increase Southland supply chain competitiveness for golf club manufacturing. Example projects are listed here. The IMEC Innovation Voucher program, Walmart JUMP initiative reshoring funding, and several solution providers would be utilized to increase the productivity of machining, for instance. Argonne’s Aurora supercomputer would be used to simulate different manufacturing processes. Regional machinery builders would be employed to design and manufacture automation equipment. Each of the Productivity Projects would be strategically chosen to increase the productivity of the entire golf club manufacturing supply chain. An ROI will be projected for each option to determine which projects to pursue.

Deliverable: ‘Digital’ Golf Manufacturing Supply Chain with protectable competitive advantage

Step 4 - Increase Revenue

Golf club manufacturing returns to the Southland. Multiple supplier companies realize an increase in revenue and productivity and Wilson Sporting Goods has multiple ‘made in USA’ features and benefits to differentiate them in the golf club equipment market. The new revenue creates new jobs, increases tax revenue, and helps provide new, living wage opportunities for individuals.

Deliverable: New Revenue, Jobs, Prosperity