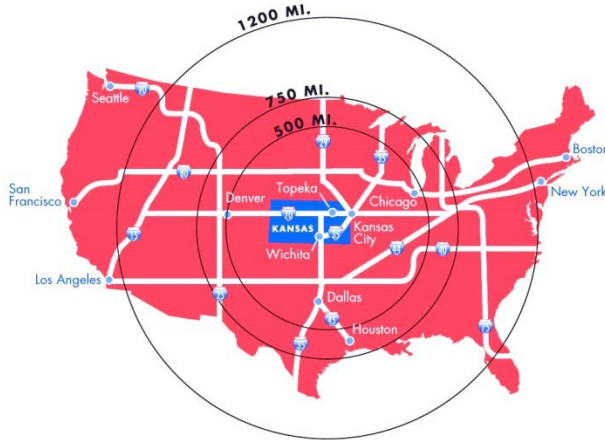


Investing in Manufacturing Communities Partnership, Phase II

April 14, 2014

Tactical Investment in Advanced Manufacturing Capabilities (TIAMC)

B “Among the 100 largest metropolitan areas, the most manufacturing-specialized metropolitan area is Wichita, where manufacturing’s share of jobs was 2.10 times its nationwide share.” (Appendix A)



QCEW Annual Data Wichita, KS MSA	Employment 2012	
Total Private Wichita MSA	239,429	
Manufacturing, NAICS 31-33	52,584	
	22.0%	2.0 LQ
Petroleum and coal products manufacturing, NAICS 324 *	635	
	0.3%	2.6 LQ
Machinery manufacturing, NAICS 333 -	5,088	
	2.1%	2.2 LQ
Transportation equipment manufacturing, NAICS 336	30,257	
	12.8%	10.0 LQ
Aerospace product and parts manufacturing, NAICS 3364	30,546	
	12.8%	28.5 LQ

Industry Sector: Advanced Manufacturing¹
 Industry Cluster: Aerospace, Machinery and Petroleum and Coal Products Manufacturing

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¹ Regional advanced manufacturing industries that will benefit from technological and supply chain improvements in advanced materials (composites and lightweight novel metal alloys) include the renowned aerospace cluster (NAICS 3364, Employment LQ of 28.5 for Wichita MSA and 21.2 for region), transportation equipment manufacturing (336), machinery manufacturing (333), and petroleum and coal products manufacturing (324).

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A. Point of Contact

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B. Assessment of Local Industrial Ecosystem

B.1. Industrial Ecosystem: Mixed Manufacturing Anchored in Aerospace Products

Key Technology or Supply Chain (KTS)	Advanced materials ² for advanced manufacturing/high-technology manufacturing including transportation equipment manufacturing (336), machinery manufacturing (333) and petroleum and coal products manufacturing (324). The employment location quotient (LQ) ³ for aerospace products and parts manufacturing (NAICS 3364) is 21.22; the IMCP Employment LQ cutoff is 1.00.
Geographic Boundaries	South Kansas (27 county region ⁴) with a manufacturing hub in the Wichita, Kansas Metropolitan Statistical Area (MSA).

² Advanced materials include the following: newly designed metallic alloys, non-metallic composite, and polymer materials that are utilized in high-technology applications such as electronics, computers, fiber-optic systems, spacecraft, aircraft, and military rocketry. Advanced materials are typically either traditional materials whose properties have been enhanced or newly developed, high-performance materials.

³ Location quotients (LQs) are a common measure of the concentration of a particular industry in a region relative to the nation (reference area). The LQ consists of the ratio of the share of total regional employment that is in the particular industry and the share of total employment in the nation (reference area) that is in the particular industry. An LQ greater than 1.0 for a particular industry indicates that the region is relatively concentrated, whereas an LQ less than 1.0 signifies a relative under-representation. An LQ above 1.2 denotes employment concentration well above the national average.

⁴ South Kansas includes the following counties: Allen, Anderson, Bourbon, Butler, Chautauqua, Cherokee, Coffey, Cowley, Crawford, Elk, Franklin, Greenwood, Harper, Harvey, Kingman, Labette, Linn, Marion, McPherson, Miami, Montgomery, Neosho, Reno, Sedgwick, Sumner, Wilson, and Woodson.

Table 1. Strength of Community's Advanced Manufacturing Industries (Additional Detail in Appendix A)

Strength of Community's Advanced Manufacturing Industries <i>*Highlights of the most concentrated industries.</i>		Location Quotient					
		Employment			Establishment		
NAICS Code	NAICS Code Description <small>NOTE: LQ calculated from U.S. Census County Business Patterns 2011 Data "Sum of Paid employees for pay period including March 12 (number)." If exact industry employment for a county is suppressed in the data to protect confidentiality, the midpoint of the reported employment range was used to estimate employment.</small>	Employment LQ Cutoffs	5-County Wichita MSA	27-County South Kansas Region	Establishment LQ Cutoffs	5-County Wichita MSA	27-County South Kansas Region
3364	Aerospace product and parts manufacturing (Level 1 High-technology Industry (HTI)**)	1.00	31.18	21.22	1.00	19.99	13.33
3334	Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	1.13	6.81	5.08	1.11	1.13	1.33
3331	Agriculture, construction, and mining machinery manufacturing	1.08	6.46	6.22	1.22	1.91	3.99
3325	Hardware manufacturing	1.33	6.46	4.25	1.11	0.77	0.91
3149	Other textile product mills	1.13	4.54	3.67	1.14	1.54	1.40
3241	Petroleum and coal products manufacturing (Level 3 HTI)	1.27	2.82	5.48	1.32	2.71	2.66
3341	Computer and peripheral equipment manufacturing (Level 1 HTI)	1.00	2.58	1.65	1.00	0.89	0.52
3327	Machine shops; turned product; and screw, nut, and bolt manufacturing	1.06	2.33	2.05	1.03	2.10	1.81
3255	Paint, coating, and adhesive manufacturing (Level 3 HTI)	1.00	2.13	1.52	1.02	1.18	1.22

** Note: Science and Engineering occupations as a percent of total industry employment are at least five times the national average in Level 1 High-technology Industries (HTI) and at least two but no more than five times the national average in Level 2 HTI.
Source: U.S. Census County Business Patterns 2011 Data "Sum of Paid employees for pay period including March 12 (number)."

* Note: The 27-County Kansas region has 59 four-digit manufacturing NAICS (68.6 percent) with employment or establishment concentrations that are equal to or exceed the top one-third concentration level. The top nine industries are listed in the table above.

Priority KTS	South Kansas is poised to be a global leader in advanced materials and their commercialization in advanced manufacturing/high-technology manufacturing.
Assets	The region's dominance is due to its unique world-class assets in the following areas: workforce and training, supplier networks, research and development, infrastructure and site development, and trade and international investment.
Gap	The gap—and catalytic priority—is in research, development, and demonstration.
Proposal	This proposed program will add advanced manufacturing research, development, and demonstration capacity through four new university centers of excellence and two rural fabrication laboratories. Local funding will be used for the construction of a \$42.5 million technology building. Investing in Manufacturing Communities Partnership (IMCP) proceeds will support the staffing of the new entities until program income can cover personnel costs and a public investment for equipment, supplies, and program support, which includes \$3 million per advanced manufacturing/high-technology manufacturing center of excellence and \$250,000 per Fab Lab (Section B.4.4. and Appendices M, N, and O).
Anticipated Outcome	This designation and funding will allow for the accelerated insertion of advanced materials and automation in to the production process, bringing together large and small businesses, defense contractors, research enterprises, academia, university researchers, students, support organizations, and government agencies to accelerate innovation by investing in industrially relevant advanced manufacturing technologies. This designation will help make South Kansas a continuous global leader in advanced materials and a provider of well-paying jobs.
Output Measures	Technology Readiness Level (TRL) score, investment, intellectual property measures, average annual job creation, real-time job postings, average wage by two-digit industry codes, unemployment rate, academic achievement on No Child Left Behind test scores, new business start-ups and expansions, venture capital investments, patents, and Kauffman Index of Entrepreneurial Activity.

South Kansas is located 160 miles southeast of the nation's geographic center and 125 miles from the North American geodetic center. Interstate Highway I-35 links the region with a large trade area that encompasses a population of more than one million within a 100-mile radius.

The region has a diverse economic base, producing a wide variety of products and services. Approximately 32.5 percent of regional employment is in goods-producing industries. According to a Brookings manufacturing report, "Among the 100 largest metropolitan areas, **the most manufacturing-specialized metropolitan area is Wichita**, where manufacturing's share of jobs was 2.10 times its nationwide share⁵" (see Appendix B). Nearly 94 percent of the area's business establishments employ fewer than 50 workers. Regional growth is stimulated by these

⁵ Susan Helper, Timothy Krueger, and Howard Wial, Brookings Institution, *Locating American Manufacturing: Trends in the Geography of Production*, May 2012, <http://www.brookings.edu/search?start=1&q=locating+manufacturing>.

small firms, as well as local aircraft companies that combine to produce a significant number of the world’s general aviation and commercial aircraft parts. Through the Investing in Manufacturing Communities Partnership (IMCP) strategic investments and public-private partnerships, South Kansas will serve as the regional hub of manufacturing excellence, help to make manufacturers more competitive in global markets, and encourage investment in the U.S.

South Kansas is a mixed manufacturing ecosystem anchored in aerospace products. Due to the nature of aerospace’s complex and regulated manufacturing environment, the region’s manufacturers have the most complex design, automation, advanced materials, machinery, and fabrication supply chain needs. The depth and expertise within the supply chain transfers into supply chain for production of equipment; heating, ventilation, air conditioning; and specialized machinery. The common thread throughout all of these is advanced materials.

Aircraft and aircraft components have been built with Wichita expertise and craftsmanship for nearly 100 years. Wichita offers one of the largest aerospace labor pools and supplier

networks in the world. According to a Milken Institute study, Wichita, the Air Capital of the World (Figure 1), has the highest concentration of aerospace manufacturing employment and skills in the nation. About 55 percent of the Wichita metro area manufacturing employment (52,400, 18.2 percent of all jobs—**#1 concentration rank in U.S. MSAs—or some 28,500 persons**) is in aerospace products and parts manufacturing.⁶

The Wichita area hosts three original equipment manufacturers (OEMs)—Bombardier Learjet, Cessna Aircraft, and Beechcraft Corporation—as well as an Airbus Engineering Design Center and Spirit AeroSystems, the largest employer in the region. Decades of aircraft production have built a comprehensive network of more than 350 precision machine shops, tool and die shops, and subcontract manufacturers. Those leading-edge suppliers include Spirit AeroSystems, the world’s largest independent producer of commercial aircraft structures. Located in South Kansas is some of the most specialized equipment in the world for metal and composite material fabrication. Manufacturers utilize precision production skills to produce high-value-added products such as industrial-commercial machinery, computer equipment, fabricated metal products, instrumentation and controls, photographic equipment, plastics and composites, chemicals, petroleum refining equipment, and electronic equipment.

In order to grow, or even maintain economic prosperity, the region needs to improve its innovative capacity through increased research and development (R&D) spending, greater investment in local research and development institutions, enhanced workforce training, and additional institutions for collaboration. The advanced manufacturing/aerospace industry in Wichita had a significant competitive advantage post-World War II with a young and experienced workforce and a growing stable competitive environment allowing it to achieve world market superiority. As global competition developed, there were pressures to reduce costs



Figure 1. Wichita: Air Capital of the World

⁶ Bureau of Labor Statistics, Employment, Hours, and Earnings, State and Metro Area, Current Employment Statistics (CES), December 2014 preliminary not seasonally adjusted data pulled on Feb. 12, 2014.

to remain competitive. Fabrication and other non-core processes were moved to second-tier suppliers and out of the country to leverage low labor costs. This cost-reduction maneuver was not as successful as it was for the automotive industry, due to the technical complexity and the amount of direct support required for aerospace/advanced manufacturing quality requirements; the low-cost competitive advantage has diminished. The industry needs to apply automation technologies to the manufacturing processes to re-establish cost-competitive manufacturing capabilities. Additionally, the region will need to strategically expand from a low-volume, high-precision industry leader (aerospace and machinery manufacturing) to a high-volume, high-precision manufacturing industry participant/competitor.

Early in 2014, a regional 50-member IMCP Task Force was convened to familiarize manufacturers and public sector partners⁷ with IMCP objectives and potential outcomes. The project builds on Kansas’ participation in the Governor’s Economic Summits, the National Governors Manufacturing Policy Academy, more than 50 interviews, and three regional meetings to collaboratively identify and prioritize key manufacturing strategic investments that would improve facilitation of innovation, development, production, and sale of products, as well as corresponding workforce quality. **The Task Force prioritized advanced manufacturing research and innovation investments as the primary catalytic public investments for the region.** Public sector investments in university centers of excellence and industry-driven curriculum to support advanced manufacturers in flexible design and testing, advanced materials development (composites, metals, and polymers), automation, and prototyping are essential to the accelerated deployment of competitive advanced manufacturing technologies and products in the private sector.

B.2. Workforce and Training

B.2.1. Current Capabilities: Quality, High-Productivity Manufacturing Workforce

The South Kansas workforce has a nationally renowned track record for productivity, quality, and strong business acumen. Table 2 provides U.S., regional, and county-level data on the age distribution of the workforce for 2010 and 2013. There has been a 0.5 percent increase in the regional workforce age population, with 3.1 percent gains in mid- to late-career (experienced) workers. The aging of the workforce follows the national trend and indicates the need to train replacement workers. Appendix C contains additional detail.

Table 2. Workforce Population by Age Cohort, 2010 and 2013

County	Early to Mid Career Population AGE 15 to 44			Mid to Late Career Population AGE 45 to 64			Workforce Age Population AGE 15 to 64		
	2010	2013	Percent Change	2010	2013	Percent Change	2010	2013	Percent Change
South Kansas Region, 27-County	405,332	400,313	-1.2%	264,757	272,858	3.1%	670,089	673,171	0.5%
Kansas	1,137,359	1,138,543	0.1%	724,291	737,660	1.8%	1,861,650	1,876,203	0.8%
United States	126,356,039	126,083,548	-0.2%	80,007,649	83,112,807	3.9%	206,363,688	209,196,355	1.4%

Source: Pcenus Nielsen Estimates.

Table 3 identifies the top five occupations required by the key technology or supply chain (KTS) employers, which include workers with assembly, engineering, engineering technician, machining, inspector, business, and computer skills. This table includes the average compensation (median wage) in relevant fields as well as the number of people with similar skills that reside in the region. See Appendix D for additional occupations and detailed data.

⁷ IMCP Task Force stakeholders included leaders from the following: end users, suppliers, workforce development, education, innovation sources (R&D and T&E), capital, infrastructure, government, and economic development.

Table 3. 2012 South Kansas Regional Employment in Top Seven (7) Highest Concentration Manufacturing Industries

	SOC Code	Standard Occupational Classification Title	Typical Education Needed for Entry	Hourly Median Wage	Regional Employment
1	51-2011	Aircraft structure, surfaces, rigging, and systems assemblers	High school diploma or equivalent	\$24.35	3,070
2	51-2092	Team assemblers	High school diploma or equivalent	\$17.98	6,827
3	17-2011	Aerospace engineers	Bachelor's degree	\$45.63	4,832
4	51-4041	Machinists	High school diploma or equivalent	\$18.41	3,819
5	51-9061	Inspectors, testers, sorters, samplers, and weighers	High school diploma or equivalent	\$22.80	2,961

Source: Wage data is from the May 2012 Occupational Employment Statistics (OES) Survey for Wichita, KS MSA.

* Estimated number of people with similar skills currently residing in the region based on Wichita MSA occupational employment as a percent of the 27-county regional employment.

Table 4 identifies the requisite skills for high-demand KTS employers. These are listed by the overall percent of importance with critical thinking skills scoring highly in all occupations. See Appendix E for additional occupations and detailed data.

Table 4. Requisite Skills for KTS Employees

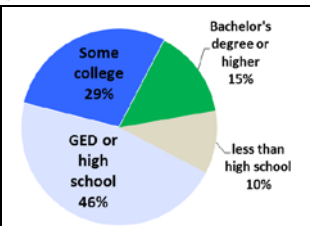
Top Ten O*NET Skills for KTS Employees Listed by Overall Percent of Importance		Critical Thinking	Reading Comprehension	Active Listening	Speaking	Complex Problem Solving	Judgment and Decision Making	Monitoring	Time Management	Coordination	Writing
1	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	56	50	53	47	56	56	53	53	41	41
2	Team Assemblers	50	47	50	50	44	44	53	50	53	38
3	Aerospace Engineers	78	75	72	72	72	63	66	56	60	69
4	Machinists	53	50	50	47	47	47	50	47	50	44
5	Inspectors, Testers, Sorters, Samplers, and Weighers	53	53	60	53	44	50	53	44	50	47

Source: ONET OnLine Detailed Report by Occupation. <http://www.onetonline.org/find/>.

As shown in Table 5, it is estimated that there are 11,000 additional workers with a bachelor's degree or higher in the region; some of these workers have previous experience working for KTS employers and others can be re-engaged with minimal additional training.⁸ This estimate is conservative because there are also underemployed workers and new entrants in the workforce who are also available. The same is true for workers with some college (22,845) and GED or high school attainment (36,890). The region also has adult education programs to upskill workers with less than a high school education. The existing workforce, training assets, and highly-engaged local workforce investment boards coordinate with educational institutions that have sufficient structures to expand capacity and programming.

Table 5. Estimate of Additional Employees for KTS Employers by Educational Attainment

Labor Force 2012	Employment-to-Population Ratio		Estimate Additional Employees	
	2012	2002-2008	MSA	South Kansas
302,447 Wichita MSA				
471,395 South Kansas*	47.55%	52.36%	51,118	79,673*
Bachelor's Degree or Higher	Some College		GED or High School	Less than High School
11,624*	22,845*		36,890*	8,314*



Source: U.S. Department of Labor, Local Area Unemployment Statistics; U.S. Census Bureau, Annual Estimates of the Population of Metropolitan and Micropolitan Statistical Areas; Kansas Department of Labor, Demographics Profile of Unemployment Insurance Beneficiaries.

*South Kansas data is estimated based on Wichita MSA employment as a percent of 27-county South Kansas employment.

⁸ To estimate the number of employees that could be added to the regional workforce with minimal additional training, the region applied the employment-to-population ratio that existed prior to the great recession to the current population in order to estimate the number of unemployed workers in the region. The demographic profile of unemployment insurance beneficiaries provides information on the educational attainment of the unemployed workers.

B.2.2. Current Institutions for Improving Capability: Recent Investment in K-20 Pipeline to Increase Quantity and Quality of Engineering and Technical Workforce

In May 2011, Kansas responded to the need for increased engineering degree-granting capacity with approval of the University Engineering Initiative Act (UEIA). The UEIA allocates \$3.5 M per engineering college per year for ten years, beginning in FY 2013. The UEIA will provide the state of Kansas with 1,365 engineering graduates per year by 2021, representing a nearly 60 percent increase in the number of engineering degrees awarded.

The National Center for Aviation Training (NCAT), a \$54 million Sedgwick County technical college, shown in Figure 2, opened in August 2010. This training center focuses on the immediate needs of aerospace and general manufacturing industries to ensure that the community can supply highly skilled and qualified workers and raise the standard of living by supporting the existing industry cluster.



Figure 2. National Center for Aviation Training (NCAT)

NCAT's managing partner, [Wichita Area Technical College \(WATC\)](#), serves as the lead institution for the National Aviation Consortium (NAC) project, having received a \$15 million U.S. Department of Labor Trade Adjustment Assistance Community College and Career Training Grant (TAACCT). Consortium partners include lead colleges from Oklahoma, North Carolina, Washington, and Indiana. The Manufacturing Institute (MI), an affiliate of the National Association of Manufacturers (NAM), provides critical linkages to partners representing industry and policy leaders. NAC's overarching goal is to increase industry-recognized credentials through a proven accelerated, online, interactive, simulated approach that results in closing the skills gap, produces qualified advanced manufacturing workers, and retrains and up-skills the existing workforce. The NAC, which focuses on building evidence-based models that provide the aviation manufacturing sector with well-trained, entry-level workers who can demonstrate critical skills and be immediately productive in the workforce, provides just-in-time training that meets employer needs for mechanical assembly, electrical assembly, quality assurance, tooling, computer network controls (CNC), etc. The Consortium targets transitioning veterans as part of its student recruitment strategy and leverages the *Get Skills to Work* network. **R&D advanced materials manufacturing methods developed with the IMCP can seamlessly be incorporated into nationally distributed workforce training models and credential development.**

Integrating an understanding and application of R&D into educational programs is a strategic goal of the region's largest educational institutions. One example can be found at the National Center for Aviation Training, a facility in Sedgwick County that fuses Kansas' aviation experience and expertise with cutting-edge instructional techniques and technology to forge a new educational standard. At NCAT, both the WATC and Wichita State University's (WSU) National Institute for Aviation Research (NIAR) share space, providing workforce training and specialized training with combined research and training opportunities for students. Students experience hands-on application and learning from researchers as they develop new manufacturing practices. Pittsburg State University (PSU) students similarly integrate R&D from the Kansas Polymer Research Center.

Forty-four regional post-secondary institutions currently provide programs to support occupational skill development needed by the KTS, and institutions have the capacity and willingness to develop new programs and upgrade existing programs.⁹ Multiple programs

⁹ This includes nine four-year universities/colleges, 15 public community/technical colleges, two union training centers for registered apprenticeships, 21 private career schools/colleges, and additional private corporation, community-based, post-secondary training institutions. These programs award industry-recognized degrees (PhD, MS, BS, AA) and industry-recognized

related to new technology and improved efficiencies in the workplace have been specifically developed, based on the demand of employers, to meet the needs of the workforce. One example is the career and educational/training pathway for engineering technology. Employers working closely with the community and technical colleges have developed a portfolio of ten-week certificate programs that can be built upon or stacked together with other certificate programs and lead to a two-year associate's degree. Articulation plans between the community and technical colleges and the four-year universities enable workers to continue their education, many while working, to achieve a BS in Engineering Technology degree, leading to improved earnings and job security for workers. Industry experts serve on all curricula advisory boards.

Another significant workforce initiative in Kansas is the 2012 Kansas Senate Bill 155. This bill provides financial support to promote career and technical education (CTE) for Kansas high school juniors and seniors in three ways: (1) free tuition for eligible technical education courses taken at technical or community colleges, (2) transportation from the high school campus to the college campus, and (3) incentives for industry-recognized credentials.

The South Kansas region includes four Local Workforce Investment Boards (LWIBs), each of which operates one-stop centers and are responsible for workforce center operations. These LWIBs partner with employers by providing customized human resource strategies, hiring and recruitment services, training resources, grant opportunity information, and programs designed to help local businesses succeed in the region.¹⁰

B.2.3. Gaps: Lifelong Learning to Support Advanced Materials and Process Transformation

The short-term human resource challenges faced by the local economy include the shortage of workers who possess specific technical skills (i.e., welding, systems assemblers, etc.) and knowledge to extend advanced manufacturing (automation, robotics, advanced materials, advanced joining, etc.), particularly to replace those who are aging and retiring. Additional laboratories for experience-based learning—such as the centers of excellence proposed in this application—will enable students to become workers by doing and experiencing manufacturing processes, thereby creating an unparalleled environment to continuously educate and train students and workers in advanced manufacturing skills. Long-term challenges include the high number of workers eligible to retire in the next five years and, therefore, loss of institutional knowledge when baby-boomers exit the workforce.

Table 6 shows a comparison of unemployed persons by occupation and sex in January 2013 and 2014. In January 2014, the unemployment rate in production occupations was 7.8 percent, the unemployment rate for men was 7.4 percent and for women was 8.9 percent.

Table 6. Unemployed Persons by Occupation and Sex

Unemployed Persons by Occupation and Sex	Total Unemployed (000)		Unemployment Rates (Percent)					
			Total		Men		Women	
	Jan. 2013	Jan. 2014	Jan. 2013	Jan. 2014	Jan. 2013	Jan. 2014	Jan. 2013	Jan. 2014
Not Seasonally Adjusted Household Data								
Total, 16 years and over	13,181	10,855	8.5	7.0	9.0	7.5	7.9	6.5
Production Occupations	962	709	10.4	7.8	9.6	7.4	12.6	8.9

Source: U.S. Department of Labor, Bureau of Labor Statistics, Table A-30, <http://www.bls.gov/web/empst/cpseea30.htm>.

credentials that have been approved by the state and Local Workforce Investment Boards, as well as the Kansas Board of Regents. Details can be found at <https://www.kansasworks.com/ada/services/schools/schsearch.cfm>.

¹⁰ The Workforce Alliance of South Central Kansas (WA), which serves the Wichita MSA and nearby counties, has been nationally recognized for positive outcomes as a result of coordinating economic development and workforce development strategies, and it was featured as a best practice for its career pathways initiatives in *The Promise of Career Pathways System Change*, a paper by Mary Gardner Clagett and Ray Uhalde who are with Jobs for the Future. Furthermore, in 2012, the WA led national webinars discussing sector strategies and career pathways; information about successful strategies and employer engagement was presented for the Manufacturing Institute and the United States Department of Labor

Regional unemployment rate data was not available, but data for long-term (2010–2020) occupational projections can be found in Appendix F. Nearly 1,600 annual total job openings (new jobs and replacement needs) will be required in the top 12 manufacturing occupations.

Multiple efforts to re-engage the long-term unemployed are underway in the region. A leading initiative is the WA partnership with WSU, which has enrolled more than 120 workers (90 who are long-term unemployed and more than 80 percent from underrepresented populations) in the Kansas Engineering Excellence Project (KEEP), which is designed to train workers for entry into new, emerging fields and provide growing businesses with access to a skilled engineer workforce. Additionally, the state of Kansas has an H-1B Technical Skills Training grant, which assists employers with on-the-job assistance when they hire both recent graduates not currently employed, and also dislocated or unemployed engineers who meet educational prerequisites but lack the specialized skills and experience necessary for a particular engineering job opportunity.

B.2.4. Plans: Engage All Stakeholders to Educate and Train Workers (Cradle to Grave) with Employer Driven Skills and Competencies Targeting Underrepresented Populations

The region is laying the groundwork for an innovation explosion, and at the heart of the strategy is a new WSU Innovation Campus (IC) where businesses will co-locate with university researchers, students, and supporting organizations with the common goal of translating ideas into new products and services. The IC will give students the opportunity to gain first-hand experience in their field of study by working directly with manufacturing-inspired R&D projects, acquiring the skills and mindset most needed by the advanced manufacturing industry.

Employer engagement ensures that educational and training programs develop workers with industry-required skills that are portable, meet business needs, and lead to a career path in advanced manufacturing. A Regional Manufacturing Council on Technical Education (RMCTE) is being organized in order to efficiently engage manufacturing subject matter experts. The staff-supported RMCTE will be designed to provide employers a coordinated voice to address workforce needs in the manufacturing sector operating in South Kansas and will provide workforce development professionals and educational institutions consistent direction toward meeting the talent needs in the region.

South Kansas has multiple methods to ensure that workforce benefits are broadly distributed and inclusive of underrepresented populations. To guarantee the broad distribution of benefits through programs to upgrade jobs and wages and to support disadvantaged populations, the post-secondary institutions, LWIBs, and the WSU Center for Innovation and Enterprise Engagement (CIEE) Board bylaws employ a diversified structure approach. Membership includes representation from large and small employers from multiple industry sectors, rural and urban areas, and professional and community organizations that champion underrepresented groups (i.e., Society of Women Engineers, etc.; see Appendix G).

In addition, regional institutions are coordinating for expanded use of the *WORKReady!* Certificate to ensure worker quality and reliability. This certificate, powered by WorkKeys, a product of ACT, Inc., is a nationally recognized assessment-based portable credential that gives employers and job-seekers a uniform measure of key workplace skills. Additional outreach to manufacturing organization managers will be conducted to align specific work-ready skill sets and certifications (e.g., machining, welding, robotics, etc.). Continual improvement of the workforce-development infrastructure is essential for continued manufacturing competitiveness.

B.3. Supplier Networks

B.3.1. Current Capabilities: Mixed Manufacturing Capacity and Common Supplier Network

The region has a diversified manufacturing base that is anchored by aviation and is tied to common materials and process methods. A gap in the supplier network requires improvements in materials capabilities, which the proposed IMCP designation and Centers of Excellence will fill. The 27-county Kansas region has 59 four-digit manufacturing NAICS (68.6 percent) with employment or establishment concentrations that are equal to or exceed the top one-third concentration level in the U.S., with the highest concentration in the aerospace industry, equipment manufacturing, and petroleum and coal products manufacturing at concentration levels five times the national average. Wichita aerospace companies delivered 58 percent of all small aircraft built in the United States (776), and accounted for 39 percent of all global general aviation deliveries. Spirit AeroSystems, the region's largest employer, supplied significant content to more than 60 percent of the world's commercial aircraft; and more than 70 percent of the world's fleet was manufactured in Kansas. In machinery manufacturing, the Case New Holland Wichita plant is home to the Skid Steer Loader (SSL) Product Development Team, partnering with manufacturing operations on the next generation of the SSLs.

The region has three aerospace OEMs and Tier One suppliers, with 23,000 employees and more than 300 supporting aviation suppliers that employ 14,000 workers. Aerospace firms headquartered in the Wichita MSA also manage manufacturing located in Alabama, Arizona, California, Connecticut, Florida, Georgia, North Carolina, Ohio, Oklahoma, South Carolina, Texas, Utah, and Washington, as well as Brazil, Canada, China, etc. The machinery manufacturing industry has more than 130 regional establishments that employ more than 9,700 workers. Outside of the region, machinery manufacturing facilities are located in Minnesota, Nebraska, North Dakota, Wisconsin, etc., as well as France, Latin American, Europe, etc.

Appendix H includes a list of the largest employers in the South Kansas KTS, which most notably includes aerospace—Spirit AeroSystems (10,700 workers) and Cessna Aircraft (5,400), and machinery manufacturing—AGCO Corporation (1,400), and Johnson Controls (1,100).

The manufacturing firms are connected to each other through workforce initiatives led by the local Workforce Investment Boards, trade initiatives led by the Kansas Global Trade Services and Chamber of Commerce, special-project task forces, professional societies such as manufacturers associations (Wichita Manufacturers Association, Kansas Manufacturers Group, etc.), industry groups (Wichita Aero Club, Great Plains Robotics Alliance, etc.), and professional organizations (Society of Advanced Materials Processing Engineering [SAMPE], Society of Women Engineers [SWE], Society of Black Engineers [SBE]), etc.).

Key trade and other associations with local chapters include but are not limited to the following¹¹: **General Aviation Manufacturers Association** ([GAMA](#)) represents manufacturers of fixed-wing aircraft, engines, avionics, and components; [Inventors' Association of South Central Kansas](#) fosters, promotes, and encourages the development and distribution of useful inventions and discoveries; **Mechanical and Sheet Metal Contractors Association** ([MSM](#)) focuses on current product specifications, building codes, and government regulations; **National Business Aviation Association** ([NBAA](#)) represents interests of the business aviation community; and the **National Manufacturing Association** ([NAM](#)) advocates for small and large manufacturers' policy agenda to increase global competitiveness.

Customers and suppliers from within the region and beyond support KTS regional suppliers through purchasing products; supplying components; packaging; providing transportation; providing accounting service; consulting on design, fabrication, and efficiency opportunities, etc.; and delivering services to worker families, such as medical care, day care, professional services, etc.

¹¹ See Appendix I for a more comprehensive list of key trade and other associations.

In order to generate transformational outcomes, the region's supplier network has successfully partnered with OEMs on initiatives, including, but not limited to, the following: (a) the National Aviation Consortium (NAC), funded by the Trade Adjustment Assistance Community College Career Training Grant Program; (b) National Center for Advanced Materials Performance, funded by the Federal Aviation Administration and private industry; (c) South Central Kansas Advanced Manufacturing Initiative, funded by the Jobs and Innovation Accelerator Challenge; (d) Composites Kansas, funded by the WIRED initiative; (e) South Central Kansas data-driven Regional Export Plan development, funded by the Brookings Global Cities Exchange (GCX) program; (f) and Think Tomorrow Today, funded by the U.S. Department of Urban Development (HUD).

One supplier/OEM partnership is anchored by regional firms but has drawn national membership. Regional OEMs and Tier One leaders serve on the Manufacturers Advisory Board (MAB) for the R&D partnership, the National Center for Advanced Materials Performance (NCAMP). This collaboration accelerates advances in lightweight and modern advanced materials processing and fabrication technologies, and facilitates this technology transition to U.S. manufacturing enterprises. The major objectives of NCAMP are as follows: (a) increase the efficiency of advanced material implementation into new vehicles, vessels, and aircraft, while at the same time decreasing the cost of these materials, (b) facilitate growth of the use of advanced metallic materials in manufacturing applications while addressing performance, safety, and certification issues in order to ensure operational goals, (c) examine old guidance materials related to advanced metallic materials and determine the relevance with respect to new advances in technology, (d) promote the cost-effective use of advanced metallic materials to reduce the direct operating cost, (e) integrate the results of research to form a basis for standard engineering practice and training within the Department of Defense (DOD) advanced materials community, and (f) assist in creating relevant policy and guidance materials to advance future usage.

Based on the success of this model, strategic IMCP investments in the South Kansas advanced manufacturing ecosystem would support targeted long-term public and private manufacturing investments in innovation and research that will create a more globally competitive region to attract, retain, and expand advanced manufacturing investments and spur international trade and exports.

New aerospace products for the global economy that have recently been launched from the South Kansas KTS include Cessna Aircraft's new Citation Latitude (Figure 3) midsize business jet, which made its maiden flight on February 18, 2014, a milestone in the development program,¹² and Bombardier's Learjet 85 (Figure 4) business aircraft, which is currently under development, with design tolerances remaining to be finalized and certified. Bombardier has obtained the first flight test permit from the Federal Aviation Administration (FAA) for the first Learjet 85 flight test airplane, which will likely occur in the spring of 2014.¹³ *Thousands of prototype components and structures* are part of these new aircraft; these innovations embody dramatic advances in aerodynamics, structures, and efficiency.



Figure 3. Cessna's Citation Latitude



Figure 4. Bombardier's Learjet 85

¹² Read more here: <http://www.kansas.com/2014/02/18/3296801/cessnas-citation-latitude-makes.html#storylink=cpy>.

¹³ Read more here: <http://www.kansas.com/2014/02/19/3299136/learjet-85-moves-a-step-closer.html#storylink=cpy>.

New machinery manufacturing capabilities have also been advanced with the recent \$40 million investment in an advanced coatings project by a regional manufacturer. The new facility reduces the environmental impact of the coating process, provides a better work environment for employees and enhances product quality and longevity.¹⁴ The region is not participating in the Small Business Administration (SBA) Supply Chain Analysis grant but would be interested in considering an application for the next round. Space prohibits mentioning many more examples.

B.3.2. Current Institutions for Improving Capability: Focus on Bridging the Gap between R&D and Commercialization of Technology, Materials, and Innovation

The region has a number of institutions that promote innovation and or upgrade supplier capability. The WSU National Institute for Aviation Research is a university research center recognized as the most capable university-based aviation research center in the United States, providing research, design, testing, and certification to the aviation manufacturing industry, government agencies, and educational entities. NIAR is nationally ranked first in research dollars generated from business contracts. The Institute gives students and industry access to more than 18 state-of-the-art laboratories in everything from aerodynamics and icing to crash dynamics and composite materials. It is known worldwide for its expertise in composites and advanced materials, and conducts a large percentage of the FAA's advanced materials research. In 2013, NIAR did business with more than 150 organizations in 39 states and 12 countries. See Appendix J for NIAR case studies 1–4.

The WSU Center for Innovation and Enterprise Engagement supports small- and medium-sized businesses to adopt advanced manufacturing processes and materials into additional industry sectors and business application, and thereby escalate the development and predominance of the region's advanced manufacturing cluster in the global economy. CIEE builds on regional strengths and expands the capacity of the regional employment, training, and research competencies, facilities, and infrastructure. Over the past two years, the center has fostered 11 technologies. These innovative enterprises added 48.5 full-time equivalent (FTE) workers and 22 student interns. According to the nine-point Technology Readiness Level (TRL) scores,¹⁵ firms advanced their technology along the commercialization continuum an average of 2.6 TRLs (average technology development is 12 years from concept to commercialization), six patent applications were developed and three patents were awarded, and more than \$11 million in additional investment was secured (including two Small Business Innovation Research (SBIR) awards). CIEE case studies 5–9 are found in Appendix J.

The Advanced Manufacturing Institute (AMI) at Kansas State University consists of a dedicated facility, equipment, and staffing, and provides a broad range of services and project management resources to private industry in order to advance the commercial readiness of new products or technologies. AMI begins by gaining an understanding of the technology and the value that it brings to the target market; determining an appropriate intellectual property (IP) strategy, engineering design, prototyping, and testing; and, if needed, providing assistance in the development and execution of the commercialization plan.

B.3.3. Gaps: Flexible Design and Testing, Advanced Materials Deployment, Automation and Prototyping¹⁶

The principal short-term supply chain gap for aerospace, machinery equipment, and petroleum and coal equipment manufacturing is that industries need to apply automation

¹⁴ Read more here: <http://www.kansas.com/2013/08/14/2941778/agco-plans-ribbon-cutting-for.html#storylink=cpy>.

¹⁵ See Appendix K for a fuller description of TRL score definitions.

¹⁶ See Appendix L for a diagram of the prototyping center, Appendix M for a diagram of the tactical investment in advanced manufacturing capabilities, and Appendix N for a functional diagram of the shared-use facility.

technologies to the production processes that have remained relatively unchanged in the last 50 years, in order to re-establish cost-competitive manufacturing capabilities. For example, European and Brazilian aerospace competition is at least five years ahead of the American General Aviation industry in terms of adopting process automation from fabrication through assembly, thus further increasing their global market share. To counter the gain of foreign competitors, strategies need to be developed to create centers of excellence targeting the following:

- Development of new, lighter-weight, cost-effective materials in composites and metals needed to run in parallel with commercial application.
- Development of distinct metals and parts innovation input across the range of composites, metals, and especially polymers.
- Development of cost-effective automation for manufacturing and assembly processes.
- Development of more cost-effective control, electrical, and environmental systems for improved product performance and avionic flight control needs.

Long-term supply chain gaps include the rapid development and certification of lightweight materials and associated manufacturing processes, i.e., tooling, joining, coatings, etc. WSU, economic developers, and the regional Chamber of Commerce are committed to convening and coordinating manufacturers, suppliers, and customers in order to continue discussions on improved ways to collaborate, roadmap complementary investments and refine, and extend the regional advanced manufacturing strategic initiative.

B.3.4. Plans: Integration and Co-Location of Supplier and Research Network to Increase Competitiveness

The IMCP Task Force intends to focus on improving supplier networks as a priority and seek future grants to build on local assets to improve KTS through the following:

- Establishing industrial parks conducive to supply chain integration, including support for convening and upgrading all sizes of supplier firms.
- Integrating the capability for parts and systems fabrication starting with materials formulation and moving through to full fabrication to standards and certification guidelines (i.e., Lean, International Organization for Standards (ISO) certification, etc.).
- Advancing materials knowledge to feed integrated parts design and fabrication capacity.
- Advancing materials preparation to international market specifications and standards.

B.4. Research and Innovation: The Catalytic Priority Area of This Proposal






B.4.1. Current Capabilities: Training Institutions Work Closely with Regional Researchers and Industry Experts to Integrate New Processes and Advanced Materials into Production Process as well as to Train Workers in State-of-the-Art Methods and Best Practices.

Manufacturing has long been the backbone of the regional economy, and ensuring that the region has a vibrant, innovative, and expanding advanced manufacturing industry is vital for a growing economy that creates jobs. Innovation is the key to long-term growth for the Wichita Metropolitan Statistical Area, the state of Kansas, and the nation as a whole, and ultimately determines the standard of living.¹⁷ The region currently has five organizations that will be coordinated to advance research, development, and testing innovation in advanced manufacturing. Table 7 lists the primary manufacturing research centers that leverage their

¹⁷ Robert Atkinson and Howard Wial, "Boosting Productivity, Innovation, and Growth through a National Innovation Foundation," Brookings Institute and Information Technology and Innovation Foundation, Washington, 2008, http://www.brookings.edu/~media/Files/rc/reports/2008/04_federal_role_atkinson_wial/NIF%20Report.pdf.

location within the “Air Capital of the World” and integrate business, university, and government entities in cooperative efforts to advance manufacturing technologies.

Table 7. Regional Research Centers for Advanced Materials for Use in Advanced Manufacturing

Research Center and Mission	
	<p>WSU, National Institute for Aviation Research (NIAR). Established in 1985 to conduct research, transfer technology, and enhance education for the purpose of advancing the nation’s aviation industry, and assisting non-aviation industries that may benefit from aviation-related technologies. NIAR laboratories include the following: Advanced Coatings, Advanced Joining and Processing, Aging Aircraft, CAD/CAM, Composites and Advanced Materials, Computational Mechanics, Crash Dynamics, Environmental Testing, Full-Scale Structural Testing, Mechanical Testing, Metrology, Nondestructive Testing, Research Machine Shop, Virtual Reality, and the Walter H. Beech Wind Tunnel.</p>
	<p>WSU, Center of Excellence for Composites and Advanced Materials (CECAM). Established in 2004 to provide the nation with validation and quality assurance of composites and advanced materials to be applied in the construction of aircraft through the following: (1) research, testing, certification, and technology transfer; (2) coordination and cooperation with the FAA, aircraft manufacturers, materials suppliers, and airline companies; and (3) education of aircraft manufacturing and maintenance workforces.</p>
	<p>WSU, Center for Excellence for General Aviation Research (CGAR). Established in 2001 to enhance aviation-related research, education, technology transfer, and utilization in mission-critical areas; and to respond to the research interest and needs of the aviation industry through synergistic relationships developed between academia, industry and government. CGAR’s industry partners include but are not limited to the following: Aeroshell, Boeing, Bombardier, Cessna, Frasca, Goodrich, Jeppesen, Lancair, Lockheed Martin, Raytheon, and Sun Microsystems.</p>
	<p>WSU, National Center for Advanced Materials Performance (NCAMP). Established to provide the nation with a center for the validation and quality assurance of composites and advanced materials to be applied in the commercial and military aviation industry through the following: (1) data-sharing among multiple users, (2) statistical continuity from one length-scale to another, and (3) reduced testing via increased capability and use of numerical/analytical simulation tools. NCAMP has 300+ industry partners.</p>
	<p>Pittsburg State University (PSU), Kansas Polymer Research Center. Established in 1994 to carry out research in the polymer/plastics area and to complement the educational program offerings in the College of Technology. The PSU Polymer Research Center is primarily engaged in applied research. Its mission is to help clients solve development and production problems in the field of polymers and plastics.</p>

Training institutions work closely with regional researchers and industry experts to integrate new process and advanced materials into production procedures as well as to train workers in state-of-the-art methods and best practices. At Sedgwick County’s National Center for Aviation Training, Wichita State University and Wichita Area Technical College partner to provide a unique mix of research and training options. With the establishment of NCAT in 2009, Sedgwick County seized an opportunity to optimize the area’s unique resources: the research capabilities and expertise of the WSU’S NIAR and the wide range of aviation technical training programs offered by WATC. Locating both of these entities under one (very large) roof has created a fast path for incorporating current research methods and trends used by NIAR into technical training programs and courses – a process that has historically taken up to five years to accomplish. Facilities and equipment that are used by NIAR for research and testing are also used by WATC for training – and often, researchers double as course instructors.

The community has limited shared facilities, such as incubators. This deficit will be addressed in Section B.4.4. and includes the proposed WSU Innovation Campus that weaves together, in one site, university research; technology transfer; graduate and undergraduate education; and new business innovation and entrepreneurship accelerator. WSU and PSU have numerous research centers but no industrial commons/shared-use facility. WSU NIAR encompasses a total of 320,000 square feet of laboratory and office space in four locations in the

Wichita area, and the College of Engineering has more than 60,000 square feet of research and educational laboratories.

To help small businesses and start-up companies, WSU used proceeds from the Jobs and Innovation Accelerator Challenge (JIAC) grant award to increase the capacity of the innovation ecosystem and to support technology-based economic development. Over a two-year period, 15 manufacturing roundtable information sessions with 83 technical assistance classes were held. The average attendance was 76 participants per event, for a total of 1,141 businesses and regional leaders attending the WSU JIAC Industry Roundtable events. Additionally, 11 competitively selected innovation/technology small businesses and/or start-up companies were provided funding to support business development. Support ranged from \$7,200 to \$50,000 for a 12-month scope of work, with a cost match provided by the firm. These firms added 48.5 FTE workers and 22 student interns. Per the nine-point TRL scale, firms advanced their technology along the commercialization continuum an average of 2.6 TRLs (average technology development is 12 years from concept to commercialization), six patent applications were developed and three patents awarded, and more than \$11 million in additional investment was secured (including two SBIR awards).

To track the number of new business startups or expansions, the region relies on the Information Technology and Innovation Foundation Index by Robert Atkinson and the Ewing Marion Kauffman Foundation, the State New Economy Index. Kansas business start-ups and failures as a percentage of total firms was 32.1 percent in 2012, giving Kansas a ranking of 31 among the states. The state's performance on these indexes falls in the middle third of all states; South Kansas needs to improve the ecosystem for developing small business and start-ups.

B.4.2. Current Institutions for Improving Capability: Successful Implementation of “User-Driven,” Public/Private Innovation Partnerships Have Become Self-Sustaining

The region has academic and industry association institutions capable of filling the R&D gap, assisted by the IMCP designation. For more than a decade, WSU, the largest institution with a long history of working with the Kansas business community, has been using a “user driven,” public/private innovation partnership model to transfer innovation in targeted industries. The university has applied this model in three major industries and has created the structure for eight such public/private partnerships. For example, in aviation research, WSU is nationally ranked third overall and first in research dollars generated from business contracts. In addition, WSU's Advanced Networking Research Institute (ANRI) and programs in computer science and computer engineering have on-going relationships with businesses nationally and in the local community. And the Human Factors Laboratory at WSU has contracts with some of the largest electronics technology companies in the world. Among this program's most important contributions has been the development of a human interface for controlling aviation drones. WSU's Center for Innovation and Enterprise Engagement provides access to engineering student internships and design services, and the Center for Entrepreneurship supports business development for technology transfer and technology diffusion. The Advanced Manufacturing Institute at Kansas State University provides services that include designing custom test equipment, constructing the equipment, and conducting tests for final evaluation before taking a product to market.

New and existing firms are also assisted by public private partnerships such as WTC to advanced commercialization of new technologies and processes. Network Kansas, the Kansas Small Business Development Center, the state's Manufacturing Extension Partnership (MEP), and Mid-America Manufacturing Technology Center (MAMTC) also provide resources for starting and growing businesses, and support innovation development/technology-based economic development. All of these entities are partially funded by the Kansas Department of

Commerce (KDOC). Due to variations in state and federal programs and budgets, the public revenue models for these entities are frequently in fluctuation, causing variations and disruptions in services to small- and medium-sized firms.

Industry and academia are interconnected through industry-guided research at NIAR and ANRI and through industry advisory boards that create industry-demanded degree programs such as the Bachelor of Science in Engineering Technology program, which began a 2 + 2 program matriculating students with technical associate’s degrees from community and technical colleges in 2012. Industry advisory boards review the core competencies in courses and provide real-world projects and subject matter expert speakers for experience-based coursework.

B.4.3. Gaps: Infrastructure/Industrial Commons to Reduce Cycle Time for Development and Implementation of Innovations for New Product and Processes

The principal short- and long-term challenges facing regional advanced manufacturers are reduced cycle time for development and implementation of innovations for new product and processes. Even in South Kansas’ most important industry, aerospace manufacturing, challenges in manufacturing technologies significantly threaten manufacturing and high-technology jobs that have fueled the state’s economy for decades. Creation of new knowledge and ideas is crucial to improving the future economic well-being. It is the successful translation of new knowledge and ideas into society that improves lives, increases productivity, and creates jobs. The future quality of life is inextricably linked to innovation and entrepreneurship.

Regional supplier networks lack an “industrial commons”/shared-use facility (the research, development, and demonstration [RD&D], engineering, and manufacturing capabilities needed to turn inventions into competitive, manufacturable commercial products) to accelerate the formation and growth of small- and medium-sized enterprises (SMEs) that will integrate education and workforce training functions into their operations. Regional manufacturers would benefit from a shared-use facility with the goal of scaling-up laboratory demonstrations and maturing technologies for manufacturing in order to increase their global competitiveness (Figure 5).

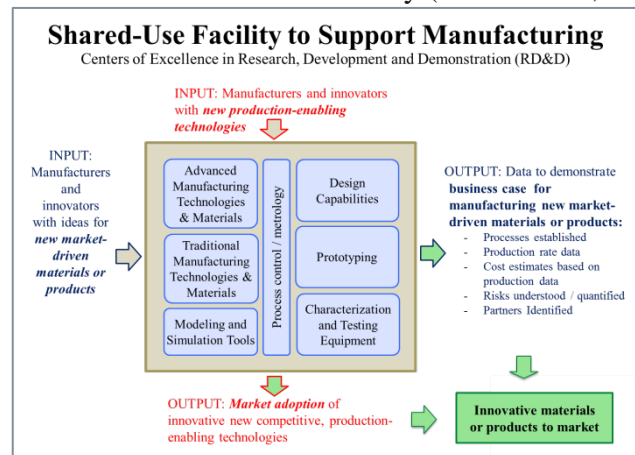


Figure 5. Shared-Use Facility to Support Manufacturing

The IMCP Task Force of manufacturers has identified four top research and innovation investment priorities to accelerate advances in lightweight, advanced materials processing and fabrication technologies, and to facilitate the adoption of technology by U.S. advanced manufacturers:

- Prototyping facilities with equipment and supporting services that integrate design optimization software including computational fluid dynamics (CFD), cutting technologies, and marching (development, testing, evaluation, and certification).
- Materials-based development, testing, and evaluation to support prototyping.
- Process improvements at both the prototyping and manufacturing stages.
- Flexible automation.

B.4.4. Plans: Strategic Planning Prioritized Advanced Manufacturing Research and Innovation Investments as the Region’s Primary Catalytic Public Investment Requirement

Regional leaders are already initiating actions to increase manufacturing innovation capacity. Early in 2014, a 50-member regional IMCP Task Force was convened to familiarize manufacturers and public sector partners with its objectives and potential outcomes. The Task Force evaluated the outputs of previous manufacturing initiatives including Kansas’ participation in the National Governors Manufacturing Policy Academy and the Governor’s Economic Summits. The Task Force staff completed 50 interviews and conducted three regional meetings. Task Force stakeholders evaluated the collective results and identified **advanced manufacturing research and innovation investments** (advanced materials, prototyping, and automation) **as the primary catalytic public investments for the region.**

The Task Force includes regional stakeholders that are currently collaborating with Wichita State University to develop a 21st century Innovation Campus that weaves together, in one site, university research, technology transfer, graduate and undergraduate education, and new business innovation and entrepreneurship. The IC is envisioned as an “industrial commons/shared-use facility” and will house private enterprises, academic programs, joint university-private enterprise ventures, and support facilities (Figure 6). The mission of the IC is to provide a venue for researchers and technologists from private enterprise to work closely with faculty and students from WSU to create and deploy globally competitive technologies in critical areas related to aerospace, software and software engineering, and human factors psychology. A primary purpose of IC is to expand the economic base of the Wichita metropolitan area through increased global competitiveness and new business formation. The IC also will house the Barton School of Business, with its nationally renowned entrepreneurship program and the experiential engineering laboratories of WSU’s College of Engineering.

The IC will involve both university- and private enterprise-funded facilities. Phase I construction of the IC is planned to begin construction in 2015, with the first facility occupied in 2016. The first building to be constructed will be Technology II, a building of approximately 140,000 to 160,000 square feet. It will house experiential learning laboratories, an entrepreneurial innovation accelerator, and research laboratories for private businesses that need to co-locate with university researchers. It is the embodiment of the university’s new strategic plan and mission,¹⁸ and will provide significant opportunities for expanded R&D, technology transfer, and commercialization of inventions and innovation. Benefits of the IC industrial commons complex include employment opportunities, research advancement, and support of technology-based economic development, including the growth of new businesses. WSU plans to be a continuous leader in experiential education, and IC provides the venue in which university students can “do as well as learn.” The IC will be a unique and highly valuable asset to the region and the state, with potential to become an engine of innovation that can drive much of the state’s economy well into the next century by creating jobs and increasing household income. Appendix U includes the WSU IC plan for the Technology II facility.

The multi-use IC will provide physical and virtual tools for rapidly prototyping advanced materials and manufacturing processes. The facility will host a collaborative, shared



Figure 6. Innovation Campus Conceptual Site Plan

¹⁸ The mission of WSU is to be an essential educational, cultural, and economic driver for Kansas and the greater public good.

infrastructure to facilitate rapid dissemination of new technologies as students and innovators conceptualize, design, develop, and fabricate almost anything. This design center investment will improve the incidence of product and process innovation in the South Kansas region, thereby creating jobs and wealth.

The IC approach outlined in this proposal will accelerate the insertion of advanced materials and automation into manufacturing production processes and provide design allowables with numerical/analytical techniques readily available at the initiation of the design process for full realization of the material performance potential and planned manufacturing. The IC will permit the concurrent development of advanced manufacturing technologies by coordinating public and private resource investments. Such technologies will significantly reduce the workload and associated costs of both the manufacturer and regulatory agencies by developing and refining critical materials, prototyping, and automation manufacturing solutions that will enable current and future commercial programs to achieve critical cost and production goals.

Innovation, entrepreneurship, and personal fabrication for garage innovators and inventors will be further supported through the development of two fabrication laboratories (Fab Labs).¹⁹ Associated with a community college and located in a southeast rural county, the first Fab Lab will be an 8,000-square-foot facility, including a large assembly shop, classrooms and offices, and a digital fabrication laboratory. IMCP proceeds will build on this investment by extending the Fab Lab’s capabilities through engagement of a highly qualified staff that can build innovative/entrepreneurial activities and curricula as well as identify, procure, and scale-up additional laboratory equipment and capabilities. A second Fab Lab, which will inspire and empower innovation and entrepreneurship by students, community members, and manufacturers, will be opened in the region’s northwest rural county in association with a community college.

The Task Force plan calls for filling the manufacturing ecosystem gap with a \$20 million investment to lever the WSU investment of \$42.5 million in the IC and a Cessna Aircraft Company donation of a facility for a rural Fab Lab. The draft three-year budget, summarized in Tables 8–10, provides an outline of how the \$20 million investment would be programmed (budget detail is in Appendix O and cost matching discussed in Section D). The IMCP would fund four (4) university IC Centers of Excellence as outlined in Section B.3.3. For each Center of Excellence, the public investment would fund two staff, two undergraduate students, and two graduate research assistants (GRAs); personnel cost will be publically funded on a sliding scale.²⁰ Over the three years, public investment includes \$2 million per center for equipment and supplies, and \$425,000 in programmatic incentives for more than \$10 million of public investment in industry-inspired and -guided research and innovation capacity. The two Fab Labs, associated with community colleges, will receive similarly structured public investments.

Table 8. Public Investment to Develop Four Integrated Centers of Excellence, Draft Budget Outline

INNOVATION CAMPUS					
Developing and Equipping Four Centers of Excellence	Number	Year 1	Year 2	Year 3	Total Years 1-3
Personnel Cost per Center of Excellence (IMCP funds 100% personnel cost in Year 1, 66% in Year 2, and 33% in Year 3; program income funds balance in Years 2 and 3.)					
Personnel Cost Attributed to IMCP per Center		\$331,997	\$225,691	\$116,132	\$673,820
Equipment, Supplies and Programmatic Initiatives		\$956,997	\$1,375,691	\$766,132	\$3,098,820
Overhead @ 48%		\$459,358	\$660,332	\$367,744	\$1,487,434
Total per Center of Excellence		\$1,416,355	\$2,036,023	\$1,133,876	\$4,586,254
Total Investment in Four Centers of Excellence	4	\$5,665,420	\$8,144,093	\$4,535,504	\$18,345,017

¹⁹ Fab Labs provide widespread access to modern means for invention. They began as an outreach project from MIT’s Center for Bits and Atoms (CBA). Fab Labs share core capabilities, so that people and projects can be shared across them.

²⁰ Personnel cost are scheduled for 100 percent IMCP funding in the initial year, 66 percent IMCP funded in the second year (34 percent of salaries and fringe to be funded by program income), and 33 percent IMCP funded in the third year (67 percent funded by program income)

Table 9. Public Investment to Develop and Further Equip Two Fabrication Laboratories, Draft Budget Outline

Fabrication Laboratory (Associated with Community Colleges)	Number	Year 1	Year 2	Year 3	Total Years 1-3
Personnel Cost Attributed to IMCP per Lab		\$110,331	\$75,003	\$38,594	\$223,928
Equipment and Supplies		\$210,331	\$175,003	\$113,594	\$498,928
Overhead @ 48%		\$100,959	\$84,001	\$54,525	\$239,485
Total per Fab Lab		\$311,290	\$259,005	\$168,119	\$738,413
Total Investment in Two Fab Labs	2	\$622,580	\$518,009	\$336,238	\$1,476,827

Table 10. Total Public Investment in Catalytic Innovation, Research and Development, and Demonstration Assets

Total IMCP Investment Request	\$6,288,000	\$8,662,102	\$4,871,742	\$19,821,843
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* Salary based on U.S. Department of Labor, Bureau of Labor Statistics, Wichita MSA Occupational Wage Survey, 2012 with three percent annual increase.

Creating the IC and Fab Labs will be the most significant economic and educational development strategy undertaken in the region’s history.²¹ The facilities will generate new capabilities and intellectual property.

The WSU IC will create an intellectual property approach that protects background IP, allocates jointly developed IP, and creates an incentive for IP exchange among IC project partners. This approach copies the university’s successful NCAMP model and is composed of three parts (see Table 11). The first part will be the application of WSU’s existing IP Protection and Allocation Policies. The second part will be policies that value background IP of small, innovative firms, thereby encouraging them to openly share their IP with negotiated collaborators. The third part will be policies that create an IP marketplace among IC project partners. This marketplace will let participants evaluate both background and new intellectual property that support one or another of the different systems solutions. This marketplace mechanism permits the commercial firms to evaluate both the technical and cost effectiveness of any given set of technologies offered for a solution.

Table 11. NCAMP Research with Industry IP Protection and Allocation

Basic Research Agreement	Applied Research Agreement	Demonstration Agreement	Specialized Testing Agreement
The Research			
Fundamental research that seeks to obtain greater knowledge or understanding of basic aspects of science.	Systematic application of knowledge towards design, development, and improvement of processes to meet specific requirements.	Product development research with a goal of improving technologies that are owned by industry partners.	Evaluation of new and existing products utilizing methods and tools common to general scientific, mathematical, or engineering principles.
IP Ownership and Licensing Rights			
Research entity owns IP. Company receives opportunity to license resulting IP.	Company pays fee to have exclusive rights to license for project IP for a set time.	Improvements to company background IP belongs to company.	Test results are owned by company.
Publication			
Results of research are ordinarily published and shared broadly throughout the scientific community.	Results of research are ordinarily published and shared broadly throughout the scientific community.	Results of research are ordinarily published and shared broadly throughout the scientific community.	Research entity may issue publications based on testing services and non-proprietary company results for research and educational purposes.

²¹ According to a recent report by Battelle, more than 100 university research centers/parks exist across the U.S. and Canada, resulting in 963 start-up companies in just the past five years. The success rate of these startup companies is 81 percent—a 31 percent increase over national statistics. Outcomes have significantly improved the economic competitiveness of their regions, generating employment and making existing companies more competitive. Source: Battelle Technology Partnership Practice, *The 2012 Survey of North American University Research Park Results*, prepared for the Association of University Research Parks (AIRP), Driving Regional Innovation and Growth, August 2013, https://aurp.memberclicks.net/assets/documents/aurp_batellereportv2.pdf.

South Kansas universities and manufacturers also intend to compete or collaborate on National Network for Manufacturing Innovation (NNMI) initiatives, previously responded to a request for information, and provided a concept paper for the DOD-led Lightweighting and Modern Metals Manufacturing Innovation (LM3I). The region will expand collaboration with the NNMI pilot institute, America Makes, for additive manufacturing.

Given the nature of R&D conducted at shared-use/Center of Excellence facilities, employment and expenditures represent only a fraction of the true benefits of the research facilities. Additional benefits include the emergence and existence of high-tech firms that locate near the facilities, collaborations with Kansas universities on cutting-edge research, experience for higher-education students through internships and part-time jobs, world-renowned research conducted in the state, and economic stability common to federally supported programs. The analysis estimates the projected discounted net benefits of the proposed project to be greater than \$71 million over the 20-year study period per the Transportation Investment Generating Economic Recovery (TIGER) Benefit-Cost Analysis (BCA). The benefits exceed the cost each year of the project with the exception of the construction year. Benefits and cost analysis details can be found in Appendix P.

B.5. Infrastructure/Site Development

B.5.1. Current Capabilities: Infrastructure and Site Capacity Exists for Growth

The region has sufficient infrastructure and logistical services to support growth in advanced manufacturing through the availability of sites that are “implementation ready” for new manufacturing investments. The Greater Wichita Economic Development Coalition (GWEDC) hosts a searchable web-based tool ([LocationScout](#)) to provide a one-stop inventory of available sites across Kansas. For 2013, the LocationScout website received a total of 20,295 hits. Table 12 highlights the inventory and associated attributes of available buildings and sites; much more detail is available on the free LocationScout website.

Table 12. Existing Manufacturing Building and Sites

LocationScout Building Search				
	Grand Total	Sale	Lease	Both
Square Feet				
Grand Total	4,430,503	410,046	990,131	3,030,326
Industrial*	3,555,655	380,403	817,929	2,357,323
Rail - Yes	301,423	97,300	42,559	161,564
Rail - No*	2,705,308	202,256	379,444	2,123,608
Rail - U	548,924	80,847	395,926	72,151
Warehouse	630,329	9,000	162,268	459,061
Office	138,201			138,201
Commercial	106,318	20,643	9,934	75,741
Rail - Yes	60,116			60,116
Rail - No	9,934		9,934	
Rail - U	36,268	20,643		15,625

Source: http://gwedc.org/location_scout/location_scout_search, Data pulled on Feb. 4, 2014.

*Largest Industrial Building: 1,213,121 square feet, 4615 S. Oliver Boeing Wichita Complete Manufacturing and Maintenance Complex (additionally 4-056G Building is 330,035 square feet, 4-140H Building is 312,318 square feet, and 4-016K Building is 47,624 square feet).

LocationScout Site Search			
	Grand Total	Sale	Sale or Lease
Acres			
Grand Total	3,291	3,058	233
Industrial*	1,527	1,294	233
Rail - Yes*	1,277	1,080	197
Rail -No	148	112	36
Rail - U	101	101	
Research/Development	3	3	
Warehouse	12	12	
Office	21	21	
Commercial	1,503	1,503	
Rail - Yes	691	691	
Rail -No	323	323	
Rail - U	489	489	
Greenfield	226	226	

Source: http://gwedc.org/location_scout/location_scout_search, Data pulled on Feb. 4, 2014.

* Largest Industrial Site: 804 Acres, Sunflower Commerce Industrial Park.

An additional available site is the Great Plains Industrial Park (GPIP), located in the heart of southeast Kansas. The GPIP offers single-owner, large-acre tracts. Of the 13,951 acres total,

more than 6,800 acres is open for development, and the Park provides a large location for advanced manufacturing and its associated supplier networks. The Park includes 106 miles of existing roadways and 30 miles of rail connected to the Union Pacific Railway, and it has water and waste-water treatment plants. Ready access by rail to the Port of Catoosa and nearby I-44 provides for shipping throughout the U.S. and offers connections to international markets. The GPIIP is property made available by the U.S. Army, due to the Base Realignment and Closure Act (BRAC) 2005.

The region also has a corridor analysis that provides comparable data related to various sites' pros and cons as well as optimal suitability of available sites to assist investors in efficient analysis of optimal suitability.

Highways and Motor Freight: Wichita is located directly on Interstate 35 (I-35), the only Midwest interstate corridor in North America to connect Canada, the U.S. and Mexico (see Figure 7). Under the North American Free Trade Act (NAFTA) this route has become the primary transportation link for trade with our northern and southern neighbors. Kansas is a major trucking hub, with I-70 accessing the East and West Coasts, and I-35 running north and northeast to the Kansas/Missouri border. I-35 (Kansas Turnpike Authority) connects with I-135 in Wichita to form a south-to-north corridor with Oklahoma and Nebraska. Another interstate, I-29, heads north from Kansas City and I-44, via U.S. 400, and offers easy east-west, four-lane access in communities in southeast Kansas.

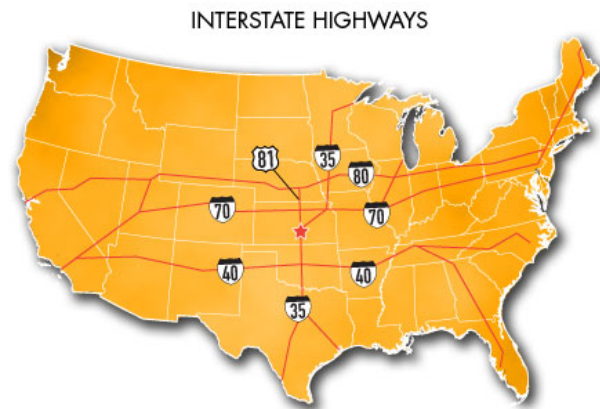


Figure 7. Highways and Motor Freight Major Routes

Air Service: [Wichita Mid-Continent Airport](#) is the largest commercial and general aviation complex in Kansas. The 3,500-acre facility has three runways (10,300 feet/7,300 feet/6,300 feet), and accommodates all aircraft and regular air-cargo service. **Rail Service:** Rail transit times to contiguous U.S. destinations range from 1 to 7 days. Given sufficient volume, dedicated trains can be scheduled to save two days from the transit time to either coast. Public truck-rail crossdock facilities are available. The nearest truck-rail intermodal service is in Kansas City (200 miles). Wichita is served by three carriers: [Burlington Northern Santa Fe \(Class I\)](#), [Union Pacific \(Class I\)](#), [Kansas and Oklahoma Railroad \(WATCO Company\) \(Class III\)](#). **Water Transportation:** Wichita has access to the U.S. Inland Waterway System via the interstate highway and rail. The [Port of Kansas City](#) is located 200 miles northeast of Wichita, with access to the Mississippi River system via the Missouri River. The Tulsa Port of Catoosa is located 170 miles southeast of Wichita. **Foreign Trade Zone (FTZ):** The Wichita FTZ has received approval to use the new alternate site framework procedures for a central region that includes Butler, Harvey, McPherson, Reno, Saline, Sedgwick, and Sumner counties. The new system makes it faster and less expensive for area businesses to establish their facilities as an FTZ. **Air Quality:** The Wichita Department of Environmental Health has monitored air pollution levels since the early 1970's. In 1999, local officials formed a work group of individuals representing industry, government, education, and the public to address the ozone levels. See Appendix Q for additional infrastructure information.

B.5.2. Current Institutions for Improving Capability: Dedicated Staff Supports Recruitment, Retention, and Expansion Activity throughout Region

The state and each of its counties have dedicated staff that work closely with private sector commercial realtors to conduct on-going analysis to identify appropriate sites for new manufacturing activity. These entities collaborate with state, county, and local government agencies to assure that sites are implementation-ready in a manner that is customized for the prospect of local expansion or a new community. Some of the sites are controlled by local government entities, some are optioned, and others are privately held. Sites are well-located, require achievable upgrades to be implementation ready, and are in locations accessible by the required workforce. These potential advanced manufacturing sites are in locations where planned use will not disproportionately impact the health or environment of vulnerable populations, and they are suitable for manufacturing investment in accordance with Brownfield Area-Wide Planning, the Comprehensive Economic Development Strategy (CEDS), and other economic strategic visions of development. The planned Centers of Excellence, as outlined in Sections B.3.3 and B.4.4, will focus on research and innovation to improve the environmental sustainability of the KTS.

B.5.3. Gaps: Coordination and Increasingly Cost-Competitive Manufacturing Inputs

The IMCP Task Force stakeholders conducted an analysis of existing and pending infrastructure gaps relative to advanced manufacturing ecosystem development. Infrastructure concerns are the following: (a) water supply capacity for both raw water and waste water; (b) rail access primarily by re-activating lines, switches, and spurs; (c) energy cost as measured by weighted average cost per unit of energy (kwh or BTU) delivered to the manufacturer; (d) road building, upgrading, and maintenance coordinated at the regional level (versus current county level); (e) broadband data communications for manufacturers outside the immediate MSA to permit receipt and transmission of out-of-product design specifications, tests, evaluations, and standards/certification documentation; and (f) improved warehousing capabilities.

Regional firms have recently recommitted their willingness to invest in the region and to address the infrastructure gaps. The Wichita Metro Chamber of Commerce and its Leadership Council, a group of about 100 of the area's top business and government leaders, has raised \$9 million for the Business at Full Throttle initiative to fund economic development for the next five years.²² Both are collaborating with WSU to break down silos between the various groups and agencies that touch economic development.

B.5.4. Plans: Leadership Council Tackles Major Economic Development Impediments

The Chamber's Leadership Council will convene quarterly and tackle major impediments to economic development success, such as improving efficiency, reliability, sustainability, and/or cost competitiveness in the movement of works or goods in the KTS and to create jobs in the KTS. The council is a think tank comprised of 100 top business, non-profit, and public-sector CEO's for the purpose of discussing and pursuing resolutions of major issues or projects to make the Wichita area competitive for job creation, talent attraction, capital investment, and therefore long-term economic prosperity. Created by the Wichita Metro Chamber of Commerce, the Leadership Council is co-chaired by Charlie Chandler (Intrust Bank Chairman and CEO) and Jeff Turner (retired CEO of Spirit AeroSystems). The council, which was formed in 2012 and held its first meeting in September of the same year, has identified three priorities:

- Grow primary jobs: double regional competitiveness in attracting outside investment and capturing expansion projects for established employers, and address pressing issues such as real estate options, diversification, and financial clout.

²² Emily Behlmann, "Wichita Chamber, GWEDC launch \$9 million fundraising, leadership campaign for economic development," *The Wichita Eagle*, September 20, 2012, <http://www.bizjournals.com/wichita/news/2012/09/20/wichita-chamber-gwedc-launch-9.html?page=all>.

- Diversify through entrepreneurship: build on the region’s rich entrepreneurial heritage by identifying, engaging, and advocating for entrepreneurial organizations, businesses, and individuals; and leverage public and private resources important to entrepreneurs.
- Enhance educational attainment and workforce development: align education and business communities to ensure a productive workforce and bring stakeholders together to demonstrate measurable progress in academic and workforce readiness through the Business and Education Alliance.

B.6 Trade and International Investment

B.6.1. Current Capabilities: Significant Export Intensity Dominated by Transportation Equipment

The Wichita MSA exported \$7.7 billion in goods and services in 2012, supporting an estimated 37,798 jobs. Pre-recession export growth rate was 8.5 percent, while post-recession export growth rate was 5.1 percent. The metro’s export intensity is significant: since 2003 more than 20 percent of the metro’s economy has been dependent on exports. In 2007, export intensity reached a high of more than 30 percent. In 2012, 27.7 percent of the metro economy depended on exports. The vast majority of the metro’s exports are manufactured goods from about 1,000 companies. There are approximately 20 foreign-owned firms recorded in the region and about 2,100 importers in Kansas.²³ Its top five export industries are transportation equipment, machinery, petroleum & coal products, computers and electronics, and chemicals.²⁴

The region’s exports are dominated by the transportation equipment industry, so it is reasonable to assume that of the 1,000 estimated export companies in the region, the majority of those are also KTS exporters. Figure 8 shows the top exporting industries in the Wichita MSA. No data could be obtained for inward or outward investment flow for the region; however, according to the Business Roundtable, “Foreign-owned companies invest in Kansas and employ nearly 55,000 Kansans.”²⁵

Total (import and export) metro area goods trade was \$56.4 billion in 2010. Of that, \$36.2 billion was advanced industrial products.²⁶ The breakdown follows:

- \$15 billion – Transportation Equipment
- \$11.5 billion – Machinery/Tools
- \$5.4 billion – Chemicals/Plastics
- \$3.4 billion – Electronics
- \$900 million – Precision Instruments

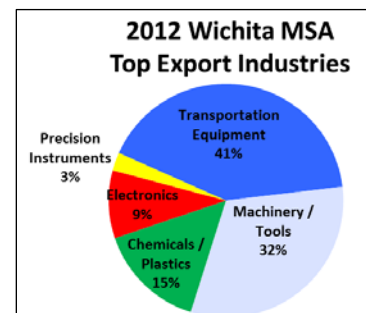


Figure 8. 2012 Wichita MSA Top Export Industries

B.6.2. Current Institutions for Improving Capability: Multiple Programs Encourage Additional Trade Volumes.

Two international service programs with the specific intent to increase export capability and support have been launched. First, the region was selected to participate in the Brookings Global Cities Initiative, a five-year commitment to begin building a globally fluent-globally competitive city. Collaborative efforts among business and government leaders from an area will build a regional export plan and a foreign direct investment (FDI) strategy in 2014 with

²³ Source: Business Roundtable.

²⁴ Source: *Brookings Export Nation 2013*.

²⁵ Source: “How Kansas’ Economy Benefits From International Trade and Investment,” Business Roundtable.

²⁶ Source: *Brookings Good Trade in Metropolitan America* (see Appendix R for additional trade statistics).

the guidance of Brookings, JPMorgan Chase, and review from seven peer cities. The entire process is guided by company executives working with government and civic leaders who are members of the Regional Export Planning Team (REPT), the cornerstone of the export planning effort, which provides recommendations, notes challenges, and facilitates regional solutions. Second, Kansas Global has recently begun a pilot program designed to capture opportunities in China's infant aviation industry.

B.6.3. Gaps: Regional Export Strategy Needed

National research conducted by the U.S. International Trade Commission and published in 2010 noted a number of impediments as burdensome. These included insufficient access to finance, complex, and sometimes nontransparent domestic and foreign regulations, rising and unpredictable transportation costs, the small scale of small- and medium-sized enterprise production, tariff and nontariff barriers, time-consuming foreign customs procedures, language and cultural differences, and lack of knowledge of foreign markets.²⁷ The IMCP Task Force concluded that the region faces the same gaps. Investigation to determine current FDI strategies is in the infancy stage, but the greatest gap observed in attracting such investment is likely the need for integration of FDI as an objective in local economic development plans. Current economic development efforts seem to involve scattered or reactive FDI activities, including attendance at global trade shows and responses to relocation requests through "normal" channels. As well, there appears to be a lack of coordination among national, state, and local economic development efforts and awareness of national programs like Select USA.

B.6.4. Plans: Broad Regional Participation in Global City Initiative is Underway.

South Kansas is currently leading an export plan through the region's participation in the Brookings Global Cities Initiative. This export planning process begins with a market assessment, includes a thorough review of historical and current data, and is supplemented by an export survey and one-on-one interviews with company executives. In addition to market assessment, the initiative will result in three deliverables: (1) export plan including implementation details, (2) FDI strategy, and (3) trade policy memo. The Core Team, made up of seven leaders representing trade, research, government, and economic development from the region and state, is responsible for delivering the final work product, which will result in an export support ecosystem for regional companies.

To clearly identify manufacturers' needs to increase exports, a survey is being executed. One-on-one interviews with select companies to gather additional granularity are also being conducted. Aggregate results will be available in the second quarter of 2014. However, it is reasonable to presume that regional manufacturers will highlight challenge areas in line with national research. Feedback from regional economic development leaders also indicates that lack of awareness of export opportunities and a fear of exporting may need to be addressed. A regional goal is to build a trade-support ecosystem to deliver assistance to manufacturers and increase exports by intentionally cultivating relationships with nations important for increased KTS exports, facilitating trade through a combination of inbound and outbound missions, training, educating, and employing case-work type company consultation. Moreover, coordinated efforts utilizing national, state, and local programs, as well as a collaborative and

²⁷ Source: United States International Trade Commission, Investigation No. 332-509, USITC Publication 4169, July 2010, "Small- and Medium-Sized Enterprises: U.S. and EU Export Activities, and Barriers and Opportunities Experienced by U.S. Firms," <http://www.usitc.gov/publications/332/pub4169.pdf>.

intentional effort among local resources to help companies meet their export potential, are essential to increasing manufacturing and service exports.

B.7. Operational Improvement and Capital Access

B.7.1. Current Capabilities: Region with Extensive Cost Competitive Utilities Distribution

The region’s operational costs provide a comparative advantage for various energy prices in the area. From the industrial natural gas standpoint, Kansas has the fourth lowest average natural gas price in the nation, and according to Westar Energy, industrial and commercial rates²⁸ in the Wichita area are three percent and 15 percent lower than the national average, respectively.

Table 13 provides fuel/energy prices for Kansas relative to the U.S. average.

Table 13. Fuel/Energy Prices for Kansas Relative to U.S. Average

Fuel/Energy Source	Kansas	U.S. Average	Period
Petroleum: Domestic Crude Oil First Purchase	\$ 91.75/barrel	\$ 91.81/barrel	Dec-13
Natural Gas: City Gate	—	\$ 4.87/thousand cu ft	Dec-13
Natural Gas: Residential	\$ 10.85/thousand cu ft	\$ 11.56/thousand cu ft	Dec-13
Coal: Average Sales Price	—	\$ 39.95/short ton	2012
Coal: Delivered to Electric Power Sector	\$ 1.74/million Btu	\$ 2.33/million Btu	Dec-13
Electricity: Residential	10.84 cents/kWh	11.72 cents/kWh	Dec-13
Electricity: Commercial	9.18 cents/kWh	9.98 cents/kWh	Dec-13
Electricity: Industrial	6.90 cents/kWh	6.62 cents/kWh	Dec-13

Source: U.S. Energy Information Administration, <http://www.eia.gov/state/search>, data pulled March 6, 2014.

An extensive distribution system exists for both natural gas and electricity, with available capacity to serve an industrial load. Limited investment is typically needed in order to extend the utility infrastructure to existing industrial spaces. Utility firms offer programs to finance infrastructure investments for projects that meet a certain feasibility standard (i.e., reasonable expectation to recover investment through added use of system). The region has growing availability of compressed natural gas fueling capability for utilization by manufacturing fleets converting to natural gas vehicles and also the availability of electric charging stations for electric vehicles. Multiple institutions (WSU NIAR, MAMTC, WA, KSU AMI, PSU Polymer Research Center, Kansas Global Trade Services, etc.) help companies reduce their business operational cost while maintaining or increasing performance, but more can be done, especially in commercialization of advanced materials and implementation of more efficient process designs, analysis tools, and automation.

B.7.2. Gaps: Access to Capital for Small- and Medium-Sized Firms

During the IMCP Task Force meetings, members analyzed information about investments to increase access to capital (equity, long-term debt, working) and international investment. The Task Force found that the small- and medium-sized business, comprising much of the supplier network, had experienced tightened credit terms requiring increasing levels of demonstrated sales or preliminary customer orders before receiving financing.

The Task Force identified the following three areas for future joint work: (a) increased investment banking staff knowledge of the local region to improve the ability to place debt that may be necessary for some of the investments to increase advanced manufacturing; (b) increased training or support services for small- and medium-sized enterprises to prepare financing

²⁸ The local commercial electricity rate is \$0.0872 per kWh, and the local industrial electricity rate is \$0.0673 per kWh. Source: Westar Energy.

requests, especially for specialized equipment available through leasing; and (c) increased export financing for SMEs.

B.7.3. Plans: Further Development of Public-Private Partnerships that Provide Capital to Commercialize New Technology and Develop/Equip Production Facilities

South Kansas manufacturers' priorities are to reduce their production costs by reducing waste, enhancing efficiency, promoting resilience, and establishing mechanisms for firms to minimize life-cycle costs. The implementation actions that manufacturers propose include the following: (a) building on enabling an infrastructure to rapidly infuse new materials into advanced manufacturing, including certification of materials and component parts; (b) improving and further integrating advanced manufacturing design and analysis tools; (c) customizing materials development to meet strategic parameters or performance qualities that are valued/required by the end-user/customer; (d) further implementing purpose-driven design; and (e) moving successful novel/innovative materials/processes/intermediate products from one industry sector to another, i.e., moving low-volume high-precision manufacturing (aerospace) to high-volume, high-precision manufacturing (automotive, medical devices, etc.).

Implementation suggestions that would further develop those public-private partnerships that provide capital to commercialize new technology and develop/equip production facilities in the KTS include the following: (a) creating services to prepare equity investment plans demonstrating revenue sources; (b) evaluating current lease financing to determine if specialized equipment requests can be handled by current local financiers; (c) improving local knowledge to place bonds, especially tax exempt bonds; (d) approaching national financiers regarding the ability to provide lease financing for specialized prototyping equipment; and (e) creating manufacturing sector-focused centers/services to prepare financing plans across an array of long-term sources (long-term debt, special facility bonds, etc.).

C. Implementation Strategy Description

The South Kansas IMCP Task Force has produced a well-designed, integrated, public investment strategy that builds on our regional strengths and addresses gaps in the advanced manufacturing ecosystem. The proposed investment strategy will attract private investment from new and existing manufacturers and lead to broad-based prosperity. **The implementation plan prioritizes public investment in research and innovation as the catalytic element to improve support for existing advanced manufacturing businesses and workers, and to build on and strengthen the region's competitive edge in attracting global manufacturers and their supply chains, which will lead to economic growth and job creation in mid-America's manufacturing hub.**

Task Force input, along with independent analysis, has formulated a strategy built from a common strength across the region, which could be leveraged to create a set of coordinated manufacturing investments. The common advanced manufacturing strength identified was advanced materials, and the alternative upon which to build was to invest in capabilities for advanced design and improved manufacturing. The region's existing economic development investment strengths relative to advanced manufacturing industry needs, national policy, and competition (domestic and international) lead to a three part cascading strategy:

1. **Advanced materials** (composites, metals, and polymers—bio and hydrocarbon).
2. **Advanced analysis, design, and qualification (ADQ) that draws on advanced materials** (thus permitting flexible manufacturing, new product features, cost savings, and new qualification capabilities).

3. **Flexible manufacturing that draws on ADQ** (thus permitting design-to-order, facility automation, and lean production).

The region lacks an industrial commons/shared-use facility (RD&D, engineering, and manufacturing capabilities needed to turn inventions into competitive, manufacturable commercial products) that will accelerate the formation and growth of SMEs, and that will integrate education and workforce training functions into their operations. Regional manufacturers would benefit from a shared-use facility with the goal of scaling-up laboratory demonstrations and maturing technologies for manufacture to increase their global competitiveness. The Task Force has agreed that Wichita State University is well-positioned to address the ecosystem’s gap by providing essential support for local industry through the development of four new Centers of Excellence to be located in the Innovation Campus Technology II building and two affiliated Fab Lab centers to be located on rural community college campuses in the northwest and southeast part of the region.

The Centers of Excellence will address the four top research and innovation investment priorities identified by the region’s advanced manufacturers, and outcomes will include acceleration of advances in lightweight, advanced materials processing and fabrication technologies and facilitate this technology transition to U.S. advanced manufacturing enterprises. The Center of Excellence will include the following:

- Prototyping facilities with equipment and supporting services that integrate design-optimization software including computational fluid dynamics (CFD), cutting technologies, and marching (development, testing, evaluation, and certification).
- Materials-based development, testing, and evaluation to support prototyping.
- Process improvements at both the prototyping and manufacturing stages.
- Flexible automation.

WSU will build the \$42.5 million Technology II structure, and IMCP funding will equip the Centers of Excellence and support the staffing of the new entities until program income can cover the cost of personnel.

D. Implementation Strategy Parties

Table 14 shows a summary of the implementation strategy parties by stakeholder type and annual cost match, which is \$15,671,121. Appendix S includes a listing of implementation strategy parties, and a summary of letters of commitment and support is in Appendix T.

Table 14. Implementation Strategy Parties by Stakeholders Type and Annual Cost Match

Summary: Implementation Strategy Parties by Stakeholder Type		Annual Cost Match Commitment	
		Annual \$	Percent
7	Economic Development	\$304,255	1.9%
10	Government Entities	\$8,106,200	51.7%
6	Higher Education Institutions	\$3,000,000	19.1%
6	Other Community Groups	\$75,000	0.5%
27	Private Sector Partners	\$4,185,666	26.7%
56	Annual Total	\$15,671,121	100.0%
	Three-Year Term	\$47,013,363	
	Five-Year Term	\$78,355,605	
	10-Year Term	\$156,711,210	

E. Performance Metrics

Metrics that the region will employ to gauge the performance of the strategy are listed in Table 15. These include measures of each technology project in development as well as the overall well-being of the manufacturing ecosystem.

Table 15. Metrics Employed by Region to Gauge Strategic Performance

Metrics to be Followed for Industry Research, Development, and Demonstration Projects
1. Technology Readiness Level (TRL). Each technology development project will be evaluated semi-annually with the TRL nine-point scale to gauge the movement along the commercialization continuum. See Appendix K for description.
2. Investment (i.e., bank loans, equity, additional grants (SBIR, etc.) retained earnings, personal/family funds, cost match, etc.). Each technology development project will provide annual outcomes related to investment: 2a. number of submissions for external funding during a 12-month period of the IMCP project, 2b. amount of additional investment awarded during the 12-month period of the IMCP project award, 2c. number of additional submissions for external funding that will likely submit for within the next 12 months, and 2d. estimated value of additional external funding needed over the next 12 months to continue project.
3. Intellectual Property (IP). Each technology development project will provide annual outcomes related to IP in the following categories: 3a. IP disclosure, 3b. patent application in development, 3c. patent application submitted, 3d. patents received, and 3e. identification of other IP protection put in place.
Ecosystem Metrics to be Tracked Quarterly (region has been tracking these objective ecosystem metrics since 2005)
4. Annual Average Job Creations for 27-County Area by Industry at Two-Digit NAICS Level and additional NAICS classifications of transportation equipment manufacturing (NAICS 336), machinery manufacturing (333) and petroleum and coal products manufacturing (324) and aerospace products and parts manufacturing (3364). Source: U.S. Census Bureau, Local Employment Dynamics, Quarterly Workforce Indicators Online (NAICS).
5. Real-Time Reports on Region's Current Job Postings. Source: GeoSolutions, Burning Glass.
6. Average Wage (Same note as Metric 4). Source: U.S. Department of Labor, Bureau of Labor Statistics, Quarterly Census of Employment and Wages.
7. Annual Average Unemployment Rate for 27-County Area. Source: Kansas Department of Labor, Labor Market Information, Labor Force Estimates.
8. Academic Achievement on No Child Left Behind Test Scores. Source: Kansas State Department of Education, Report Card.
9. Number of New Business Startups or Expansions, Job Churning in Kansas. Source: Ewing Marion Kauffman Foundation, The State New Economy Index.
10. Venture Capital Investments (Kansas). Source of Venture Capital data: PricewaterhouseCoopers National Venture Capital Association Money Tree Report. Data provided by Thomson Financial. Source of Worker Earnings: U.S. Bureau of Economic Analysis, SA05N Personal income by major source and earnings by NAICS industry -- Kansas, Line 0035 Earnings by Place of Work.
11. Patents. Source: U.S. Patent and Trademark Office, Patent Full-Text and Image Database.
12. Kauffman Index of Entrepreneurial Activity for Kansas. Source: The Ewing Marion Kauffman Foundation.

F. Federal Financial Assistance

F.1. Overall Leadership Capacity

Wichita State University is the applicant. Last year, WSU personnel were awarded more than 801 competitive sponsored awards valued at nearly \$58 million. Many of these programs involved collaboration among other universities, both national and international. A growing number of these programs focus on economic development, technology transfer, and industry, K 12, and university partnerships.

WSU's ability to administer and implement transformational regional economic development programs has been recognized for excellence by the following: (a) the Economic Development Administration (EDA) as a finalist for the 2009 Excellence in Economic Development Award

and (b) the University Economic Development Association (UEDA) 2009 Awards of Excellence finalist in Excellence in the Workforce Development category. In 2007, the region received a U.S. DOL WIRED grant and WSU administered the award for seven funded entities. In 2011, the applicant received a Jobs and Innovation Accelerator Challenge (JIAC) award, and WSU and the collaborative regional partners are successfully meeting and exceeding all performance targets including a private sector investment cost match. Performance metrics and data are collected, compiled, and published for evaluation and continuous improvement.

F.2. Sound Partnership Structure

WSU, a public, four-year, co-educational institution of higher education, will be the project lead. WSU is located in Wichita, Kansas. Established in 1895 as Fairmount College, WSU has continued to grow over the years. With 14,550 students and a 330-acre campus, WSU has the most diverse student body of all the Kansas state universities, as well as the only urban setting. The success of this proposal and the WSU Innovation Campus depends on a business-driven partnership structure. WSU and the IC will work with industry association, economic, and workforce development partners, such as the Wichita Manufacturing Association and Project 17, to convene a partnership of manufacturers. The purpose of this manufacturer's partnership is to develop and implement a regional manufacturing strategy based on business-driven priorities. A full list of stakeholders can be found in Appendix S. Stakeholder letters are in Appendix V.

F.3. WSU's Capacity to Carry Out Planned Investments

WSU's capacity to carry out planned investments in public goods, attract companies, and achieves intended outcomes is well documented. Last year, WSU personnel were awarded more than 801 competitive sponsored awards valued at nearly \$58 million. For example, the WSU EDA JIAC award received competitive applications from 42 enterprises and supported development of nine private sector technologies. From the \$850,000 investment, more than 60 jobs were created, and 125 were retained with an additional capital investment of more than \$11.5 million. Three patents were award, and three more patents are in process.

F.4. State of Ecosystem's Institutions

The South Kansas manufacturing ecosystem is uniquely positioned to maximize a "manufacturing communities" designation and to strategically implement an integrated tiered development strategy for advanced manufacturing. The Wichita MSA has the most concentrated metropolitan manufacturing sector²⁹ in the U.S., with 64.1 percent of manufacturing jobs classified as "very high-technology."³⁰ The IMCP strategy builds on previous analysis conducted with the National Governor's Association Manufacturing Policy Academy, economic prioritization of efforts to grow the business presence in advanced manufacturing by the state of Kansas, regional and local strategic visions, broad industry and non-profit engagement, extensive investment in research and development by manufacturers and federal investments (i.e., FAA, DOD, etc.), and a workforce with a reputation for innovation, entrepreneurship, productivity, quality, and strong business acumen. Stakeholders are collaborating to improve the way that

²⁹ 17.8 percent manufacturing jobs as a percent of all jobs.

³⁰ The 27-county South Kansas region has specialized **Level I high-technology industries** such as aerospace product and parts manufacturing, (NAICS 3364, with an employment LQ of 21.22) and computer and peripheral equipment manufacturing, (3341, LQ 1.65). In **Level II**: industrial machinery manufacturing, (NAICS 3332, with an employment LQ of 2.73), commercial and service industry machinery manufacturing, (3333, LQ 2.05), and basic chemical manufacturing, (3251, LQ 1.61). And in **Level III**: petroleum and coal products manufacturing, (NAICS 3241, with and employment LQ of 5.48), pesticide, fertilizer, and other agricultural chemical manufacturing, (3253, LQ 3.25), other chemical product and preparation manufacturing, (3259, LQ 2.41), other general purpose machinery manufacturing, (3339, LQ 1.61), paint, coating, and adhesive mfg., (3255, LQ 1.52), engine, turbine, and power transmission equipment mfg., (3336, LQ 1.42), and electrical equipment manufacturing, (3353, LQ 1.37).

they facilitate innovation, development, and the production and sale of products, as well as train/educate a corresponding workforce.

F.5. Development and Employment Goals

The region has a history of tracking short-, medium-, and long-term development and employment goals, and it benchmarks performance based on national average, statewide performance, and performance of peer regions. Analyses include data from federal agencies as well as proprietary data sources, news reports, and primary research including a longitudinal study of the business environment, innovation networks, regional norms and attitudes, and business demographics. See Table 15 for data sources.

For the South Central Kansas initiative, the performance goals are as follows:

- Technology Readiness Level scores: each development project will advance, on average, one TRL per 12-month period. The average time to advance one TRL is 16 months; this is a 33 percent improvement.
- **Private sector manufacturing investment will increase \$3 for every \$1 of federal support, which will be inclusive of direct foreign investments in manufacturing facilities.**
- Regional intellectual property measures that include IP disclosure, patent applications in development, patent applications submitted, and patents received will increase ten (10) percent year by year.
- **Regional average annual total nonfarm employment will increase at a rate five percent greater than the national average. The region has 380,747 employees at the start of the project. Over the last three years, U.S. employment has increased at an annual rate of 1.54 percent. If this trend continues, the region will target an annual increase in employment of 1.61 percent or five percent greater than the national average. This would be equal to 6,139 job increase annually.**
- Regional manufacturing employment will increase at a rate five percent greater than the national average. This would be equal to an annual increase of 1,195 manufacturing jobs (manufacturing jobs are a subset of total nonfarm employment).
- Regional real-time job postings will increase at a rate five percent greater than the national average.
- Regional average manufacturing wage will increase at a rate five percent greater than the national average.
- Regional unemployment rate will contract a rate five percent greater than the national average.
- Regional academic achievement on No Child Left Behind average test scores will show year-by-year improvement.
- Regional new business start-ups and expansions will increase at a rate five percent greater than the national average.
- Regional venture capital investments, patents, and Kauffman Index of Entrepreneurial Activity will show year-over-year improvement at a rate ten percent greater than the average growth rate for the most recent five-year period.

G. Geographic Scope

The Tactical Investment in Advanced Manufacturing Capabilities (TIAMC) project will be located in the South Kansas area labor basin, which includes 27 counties³¹ that have communities from which individuals may commute no more than 60 minutes for job opportunities based on transportation access to Wichita or Pittsburg (see Figure 9). Wichita, the largest city in the state of Kansas, is the financial, transportation, health care, and distribution center of the South Central Kansas region. Other cities in the region include Hutchinson, Pittsburg, and Newton. The aerospace industry is the principle economic driver in the region, and manufacturing activities are concentrated in Wichita.

³¹ South Kansas includes the following counties: Allen, Anderson, Bourbon, Butler, Chautauqua, Cherokee, Coffey, Cowley, Crawford, Elk, Franklin, Greenwood, Harper, Harvey, Kingman, Labette, Linn, Marion, McPherson, Miami, Montgomery, Neosho, Reno, Sedgwick, Sumner, Wilson, and Woodson.

According to a Brookings manufacturing report Wichita is the most manufacturing specialized metropolitan area in the U.S. where manufacturing's share of jobs was 2.10 times its nationwide share. Appendix A, Strength of the Community's Advanced Manufacturing Industries, identifies the manufacturing sectors that depict high-levels of manufacturing specialization. The 27-county South Kansas region has 59 four-digit North American Industry Classification System (NAICS) manufacturing codes (68.6 percent) with employment or establishment concentrations that are equal to or exceed the top one-third concentration level required by the IMCP. Transportation equipment manufacturing (NAICS 336) has a jobs location quotient of 10.0, or 10 times the nationwide share; more notably, the aerospace products and parts manufacturing (NAICS 3364) has a 27-county location quotient of 21.22. Additionally, the region specializes in petroleum and coal products manufacturing (NAICS 324) with a location quotient of 2.6 and machinery manufacturing (NAICS 333) with a location quotient of 2.2.

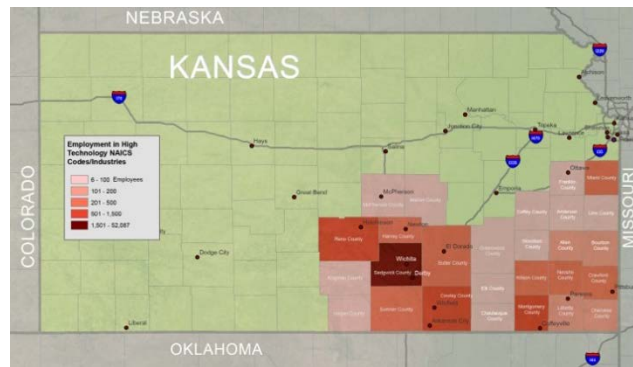


Figure 9. South Kansas Region

In 2010, Ginger Law, senior counselor of the White House National Economic Council, referenced Michael E. Porter's Cluster Mapping project for the Institute for Strategy and Competitiveness. As shown in Figure 10, Wichita was identified as a cluster for aerospace vehicles and defense, heavy machinery, and oil and gas, in terms of the share of national employment.

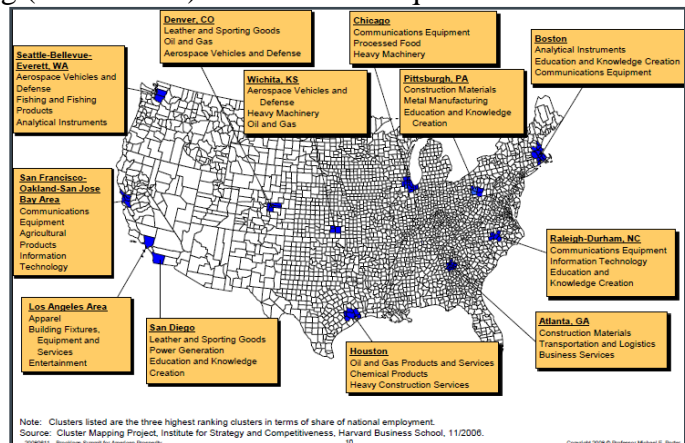


Figure 10. Highest Ranking Clusters in Terms of Share of National Employment

H. Submitting Official

This application is being submitted by Dr. John S. Tomblin, Vice President for Research and Technology Transfer. In his capacity, Dr. Tomblin oversees WSU research centers, institutes, sponsored programs, and the Office of Research and Technology Transfer and its staff, and is authorized to submit this proposal and subsequently apply for assistance.³² He has overall administrative responsibility for developing, coordinating, and stimulating research and creative activity; for enhancing external funding; and for ensuring compliance with all applicable laws and regulations. This includes leading university-wide strategic growth activities and coordinating various university units that comprise the research infrastructure, including acquisition of research funding, planning, and development of research space, research commercialization, incubation of new companies, and recruitment of corporate research partners. Dr. Tomblin is responsible for the transfer of university intellectual property to patent. The Office of Research and Technology Transfer deals with intellectual property issues associated with faculty start-up companies, especially when technology is licensed from the university.

³² WSU Policy and Procedures: Policy 1.03, http://webs.wichita.edu/inaudit/ch1_03.htm, and Policy 9.03, http://webs.wichita.edu/inaudit/ch9_03.htm.