



(2 OF 3) 2018 REGIONAL GROWTH PLAN TARGET SECTOR UPDATE

AN ECONOMIC STRATEGY FOR THE GREATER WICHITA REGION

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2018 REGIONAL GROWTH PLAN TARGET SECTOR UPDATE

This section of the report focuses more narrowly on which sectors offer the greater Wichita region the greatest potential to create new jobs and wealth for its residents through targeted economic development activities in the coming five years.

In order to reach a set of targets, Market Street conducted an extensive analysis of the greater Wichita region's economic composition and competitive position for a variety of business activities. This process included evaluating relevant findings from existing research, incorporating input received from stakeholders during the input process, and conducting an extensive analysis of business sector and workforce data. This "ground up" approach focusing on the region's workforce attributes and other assets that are conducive to specific types of economic activity forms the basis for determining where the greater Wichita region should be directing its economic development resources.

It is important to note that Market Street believed a more detailed, finer-grained statistical analysis of regional employment was necessary to better focus the greater Wichita region's targeted opportunities. As such, February 2018 employment classifications for the 2015 BREG clusters developed by CEDBR were amended to include more holistic sub-sector analysis and resulting sector NAICS "definitions." While there is some potential for inter-sectoral overlap in target definitions through this approach, Market Street feels it is warranted to accommodate the ambitions of the 2018 Regional Growth Plan.

TARGETED ECONOMIC DEVELOPMENT: A PRIMER

CLUSTERS: Agglomerations – or "clusters" – represent groups of interrelated businesses that choose to co-locate. The historical growth of clustered economic activity in areas such as the Silicon Valley, Route 128 in Massachusetts, and the Research Triangle Park in North Carolina are well-developed case studies of cluster development efforts that span decades, efforts which many other regions across the nation seek to mimic. There are countless other examples of smaller, more specialized clusters around the country and the world. Clustering can occur among competing or cooperative firms for a variety of different reasons. A group of suppliers may choose to locate in proximity to a major manufacturer for research and development efficiencies and reduced transportation costs. Other firms may co-locate in a specific area in order to take advantage of a specialized labor pool or to be in close proximity to specific infrastructure.

While the factors that have led to clustering vary tremendously by region and sector, such agglomerations occur over time because a location has an asset base that affords the sector and the companies that operate within them some form of competitive advantage. As the cluster grows, so too do the benefits afforded to the companies within the cluster: the available workforce grows, the potential for collaboration expands, competition may drive down costs, and buyer and supplier networks expand, among other potential impacts. **Aerospace in the greater Wichita region constitutes a true economic cluster.**

TARGETS: A targeted sector – or simply a “target” – is any type of business activity that is strategically pursued by an economic development organization and its partners for quality growth and development. That is to say, a target is an area where financial and staff resources, and the programs and policies they support, are specifically focused. Targets are often those segments of an economy where competitive advantages exist, prospects for future growth are greatest, and return on investment is likely highest. Many communities choose to target business sectors that are not presently concentrated in their community. This may be because such activities are rapidly expanding, exhibit potential to become clusters in the future, or align with other strategic objectives of the community. The aim of targeting is not necessarily to create new clusters of business activity – communities with multiple clusters are rare and tend to be among the nation’s largest and most dynamic economies. Rather, targeting is an intentional practice of aligning resources with the needs, vision, and underlying competitive advantages of the community.

Quantitative and qualitative assessment has determined that the greater Wichita region only has one true economic cluster: Aerospace. Thus, Market Street has changed the terminology for the remaining priority sectors to reflect their opportunities as target sectors rather than clusters.

TRADED AND NON-TRADED SECTORS: Businesses that can sell a product or service to a consumer or end user outside of the greater Wichita region, whether abroad or elsewhere in the U.S., bring new wealth into the community. This wealth then recirculates in the local economy, creating even more jobs and wealth – a so-called “multiplier” effect. Economists refer to jobs in the export-oriented sectors as “traded” or “basic” employment. By contrast, non-traded or non-basic sectors sell to markets within the region and typically expand as a result of population growth. Their potential to bring in significant wealth from outside the community is limited. Sectors can have both traded and non-traded components based on the buyers of these goods and services. Location quotients above 1.0 typically indicate that the sector has expanded beyond just the local market. **Consideration of a sector’s wealth-creating export potential is a priority criterion when determining whether to advance that sector for targeted development.** That is why the greater Wichita region sectors with high concentrations like real estate, construction, textile manufacturing, healthcare, retail, and utilities were not proposed as 2018 Regional Growth Plan targets.

UNDERSTANDING AND LEVERAGING YOUR ASSET BASE: Strategic targeting is predicated upon a solid understanding of a community’s strengths and weaknesses, specifically as they relate to the needs of specific business sectors and the companies that operate within them. The factors that medium to large companies consider when evaluating a community as a potential location for a new facility are often referred to as site location factors, site selection factors, or site considerations. These factors vary tremendously by sector. Accordingly, communities that are able to offer such characteristics are better positioned to attract these kinds of operations. Understanding the community’s asset base – inclusive of a wide variety of these potential site location factors – is critical to understanding the community’s competitiveness for various business sectors. Likewise, an understanding of its deficiencies in terms of such site location factors will help the community identify areas that need further investment if the community wishes to transform such deficiencies into future assets.

A HOLISTIC APPROACH: For decades many communities and their economic development organizations have exclusively associated “economic development” with “business recruitment.” While the recruitment of

new companies is an important component of any targeted economic development program, it is only “one leg of the stool.” Any effort to develop target sectors and nurture employment growth within them must focus upon the needs of existing businesses as well as entrepreneurs. Holistic economic development must also address the region’s asset base that supports the competitiveness of target business sectors and the companies that operate within them. This often brings to mind assets and location factors from transportation and telecommunications infrastructure to business costs and incentives. While these factors remain critical to many operations today – for example, interstate access has remained one of the most important site location factors for many decades – the quality of a community’s workforce and the quality of place are increasingly factors that guide location decisions and influence targeted economic development. Simply put, the lines between economic, community, and workforce development are increasingly blurred. In a world where access to skilled labor is the most important factor driving location decisions today, and where the quality of place is increasingly influencing the residential location decisions of workers, it is clear that community, economic, and workforce development professionals must work together to advance a community’s economic vision in a targeted yet holistic manner.

THINKING REGIONALLY, ACTING COLLABORATIVELY: Economic clusters develop regionally; the advantages that are afforded to clustered businesses from their agglomeration (external economies of scale and network effects) are rarely restricted to specific jurisdictions.¹ Furthermore, the asset base (specialized labor, transportation networks, etc.) that attracts clustered businesses is often accessible throughout a region, with accessibility rarely restricted by jurisdictional borders.

However, individual communities within a larger economic region clearly have distinct asset bases and differentiated marketable attributes that make them particularly appealing to certain types of business activities. Further, while there are often significant resources devoted to economic development at a regional level in most of the nation’s largest metropolitan areas (often via a regional, public-private partnership or regional chamber of commerce), the majority of economic development expenditures are highly localized (via a local government, local economic development organization, local chamber of commerce, development authority, etc.). Accordingly, many of these individual communities have identified their distinct assets and marketable attributes and developed a corresponding set of local target sectors. These local targets may at times align with regional targets but will often feature specific sectors that may not be a focus of regional efforts but deserve local attention given the community’s distinct assets and attributes. For example, a regional economic development organization may not proactively target regional economic development resources towards the development of Warehousing and Distribution activities, but an outlying county within the region that lies at the confluence of three interstates may view Warehousing and Distribution as a highly appropriate target sector. On the other hand, certain regional targets may not be appropriate for some local communities. For example, a city lacking any available Class A office space and a relatively weak fiber optic network may not be a suitable location for Information Technology or Corporate Headquarters operations.

All of this is to say that regional economic development operations and their target sectors must be mindful of localized asset bases and locally-defined target sectors. While regional target sectors will guide the manner in which certain regional economic development resources are targeted, these targets should not be viewed as an exclusive definition of the opportunities that can, should, and will be pursued by regional economic development practitioners. These practitioners should always respond appropriately and professionally to

the inquiries of prospective and existing employers – regardless of their sector – to help meet their needs and facilitate their growth in the region. When evaluating where a prospective new employer (a potential relocating company) may find a suitable site within the region, it is important for regional economic development practitioners to, again, be mindful of the distinct assets and targeted sectors of individual communities within the region. Regional targets will overlap many local targets, and objectives of regional target sector development should be derived, in part, from local target sector development objectives. When conducting proactive marketing, advocacy, existing business outreach, and other economic development initiatives, regional economic development practitioners should work with local communities and their economic development organizations to identify ways in which expenditures can be optimized, efficiencies can be gained, and communication can be enhanced. This should be done on a regular basis to ensure that new economic activity is directed to communities that are a good fit for both the prospective company in terms of its location needs, and the community in terms of its economic development objectives.

TARGET SECTOR ANALYSIS: APPROACH AND METHODS

There are many methods used to identify economic development targets. Some approaches are based on incomplete business sector-focused methodologies that ignore a variety of important issues from workforce attributes to educational assets to geographic advantages. Market Street’s approach to target identification is rooted in a more complete examination of the region’s strengths and opportunities, including talent – the occupations and types of knowledge that support the region’s business activities. This comprehensive, interrelated process stands in contrast to the traditional “top-down” approach long utilized in target sector identification and analysis. It recognizes the increasing importance of talent and workforce sustainability to the business community. It is complemented by an evaluation of the region’s business climate, networks, infrastructure, research assets, educational programs, and other factors that influence site location decisions.

CLASSIFICATION: Our approach does not define targets strictly based on North American Industry Classification System (NAICS) codes or Standard Occupational Classification (SOC) codes. Though these codes are used to help quantify important trends and activity within each target, they should not be interpreted as rigid definitions of the composition of economic activity within a given target. Classification systems do not adequately capture certain niche technologies and opportunities that may deserve strategic attention in certain communities.

GEOGRAPHY: The research related to business sector and occupational composition within this report is based on analysis of trends observed in the ten-county greater Wichita region. The region was developed and defined by the 2015 BREG process and includes the following counties in Kansas: Butler County, Cowley County, Harper County, Harvey County, Kingman County, McPherson County, Marion County, Reno County, Sedgwick County, and Sumner County.

LOCATION QUOTIENTS: Location quotients (LQs) are used to measure the relative concentration of local employment in a given business sector or occupation. When applied to business sector employment, they measure the ratio of a business sector’s share of total local employment to that business sector’s share of total national employment. A business sector with LQ of 1.0 is exactly the same share of total local employment as that business sector’s share of national employment. When a local business sector has a

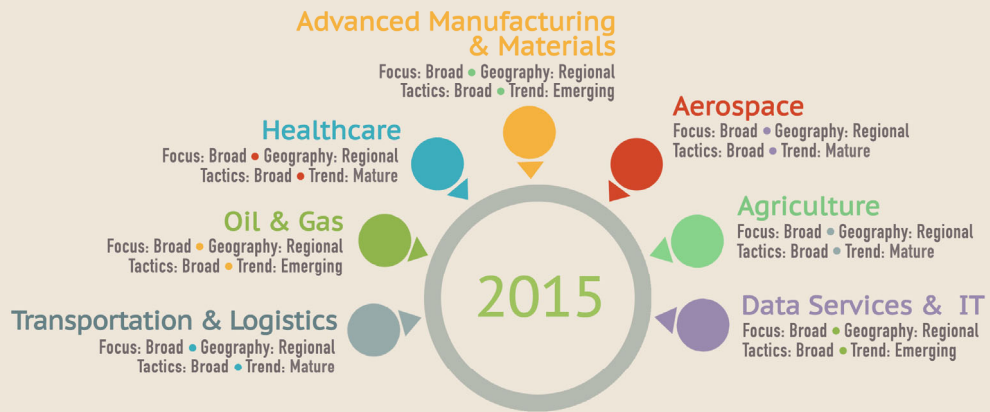
location quotient greater than 1.0, it signals that the business sector is more heavily concentrated in the metro than it is nationwide. Those business sectors with relatively high LQs are often assumed to benefit from one or more sources of competitive advantage derived from locating in the area being examined. Location quotients can also be applied to occupational employment in the same manner that they are applied to business sector employment, helping to determine which occupations and corresponding skill sets—irrespective of the business sectors that employ them—are highly concentrated in the local workforce.

DATA SOURCES: Unless otherwise noted, all quantitative data contained in this report is sourced from Economic Modeling Specialists International (EMSI), an industry-leading provider of proprietary data, aggregated from public sources such as the U.S. Census Bureau, the U.S. Bureau of Labor Statistics, the U.S. Bureau of Economic Analysis, the National Center for Education Statistics, CareerBuilder, and many others.

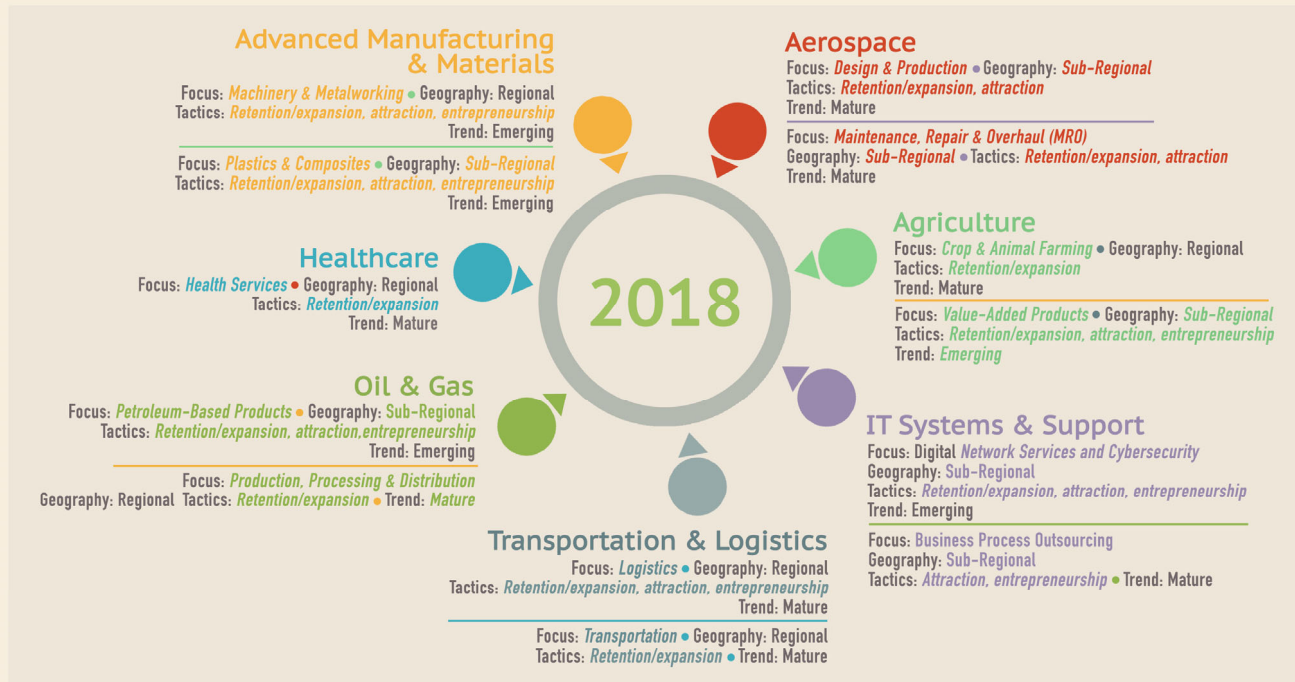
Target Sector Framework

Based on an extensive analysis of the greater Wichita region's economic composition and assets, Market Street recommends adjustments to the original seven target sectors for the community to pursue to grow and attract jobs and investment in the next five years. Though the targets from 2015 remain priorities in 2018, much has changed from the first BREG process to this 2018 Regional Growth Plan. As seen in the graphic on the next page, greater specificity and clarity have been provided in the form of focused sub-sector opportunities, identified geographic concentrations, and tactical priorities informed by recent growth trends and future projections. Regional Growth Plan sectors represent an evolution of the 2015 process rather than an overhaul. Refinements will come from differentiated strategic tactics to grow targets and sub-sector niches based on investment return and potential to build wealth and improve economic diversity. This perspective acknowledges that different strategies are required to drive growth based on the relative maturity of the sector/niche, the greater Wichita region's competitive position, and the complementary capacity provided by partners such as Wichita State University.

Sub-sector opportunities are presented under the proposed targets as differentiated "niches." **The niches reflect where the community is particularly competitive and are intended to better communicate where the opportunities and strengths exist within the broader target.** They will guide the discussion and presentation of findings in each of the target sector profiles. The niches reflect the differentiated opportunities that share complimentary strategic concerns and competitive advantages such as talent, buyer/supplier networks, infrastructure, technologies, marketing messaging, and others, that warrant being considered under the same overarching target category. Moving forward, **the niches will also be used to better focus the development opportunities and potential tactical strategies under each of the targets.**



2018 framework descriptions in color represent research-driven **ADVANCEMENTS** from 2015 clusters



These sectors are representative of the region's core economic and workforce strengths and supportive capacity and provide the best near-term opportunities for growing high-value export jobs and investment. Implementation priorities will be determined by a combination of factors contributing to that sector or niche's impact. Tactical strategies will be included in the 2018 Regional Growth Plan Implementation Guidelines rather than this Cluster Assessment, which is purely a research report. The strategy will contain specific and detailed recommendations for how to retain, expand, attract, and develop quality employment in the greater Wichita region.

As noted, four primary factors were used to better differentiate the 2015 BREG clusters from the target sectors proposed in 2018:

- **Focus:** This represents key sub-sector opportunities identified in nearly every target to better direct growth strategies.
- **Geography:** Distinctions were made based on mapping of the sector/niche's relative dispersal to highlight whether employment was spread regionally or concentrated in one or more sub-regional communities. This information will inform lead and support implementation roles as well as partnerships between local and regional economic development entities.
- **Tactics:** Each target and niche will be grown using different strategies. Determining whether these tactics comprise existing business support, external marketing and attraction, and/or entrepreneurship will help focus expenditures of time and money and maximize the value of public and private investments.
- **Trend:** Assessing the recent and projected growth dynamics of each target and niche helps identify and confirm the tactical priorities incorporated into the Regional Growth Plan Implementation Guidelines.

In the context of the "trend" component, slower-growth, mature sectors/niches will require a stronger focus on existing business services to ensure that these industry segments can remain competitive. Emerging sectors/niches, on the other hand, will benefit from existing business support but also provide more viable opportunities for prospect attraction and entrepreneurship.

- **"Mature Sectors/Niches"** represent historical export-oriented drivers of the regional economy, and, therefore, merit strategic targeting. They are currently concentrated to varying degrees throughout the region and benefit from an existing asset base that provides incumbent and prospective companies with local competitive advantage(s). However, slower recent and projected growth trajectories that are either equivalent to or behind national rates demonstrate that these mature niches have less dynamic expansion prospects than emerging categories.
- **"Emerging Sectors/Niches"** also feature strong employment concentrations but have sustained and are projected to grow at faster rates than legacy sectors/niches. Data also show that these categories exceeded national growth trends – in some cases by notable amounts – indicating that the greater Wichita region has demonstrable competitive advantages contributing to this dynamism.

To arrive at these distinctions, Market Street considered employment projections at the regional and national levels, in addition to new shift share analysis. Economic Modeling Specialists International's employment projections are based on the most recently available data and estimates from a variety of sources including the Bureau of Labor Statistics and state labor market organizations.

Shift share analysis is a standard regional analysis method that attempts to determine how much regional job growth can be attributed to national trends and how much is due to unique local factors. The competitive effect figure calculates job growth that cannot be explained by national trends in the industry or in the economy. It therefore measures how much of the employment change in each industry is due to competitive advantages that the region possesses. Like a location quotient, the competitive effect can be used to confirm that a community offers value-added benefits to firms' sectors and sub-sectors.

The following table highlights the trend projections for the proposed 2018 Regional Growth Plan target sectors.

REGIONAL GROWTH PLAN 2018 SECTOR/NICHE TRENDS

	2017		Historical 5-yr Chg. (2012-17)			Shift Share Competitive Effect (2012-17)	Projected 5-yr Chg. (2017-22)		
	LQ	Jobs	SCK #	SCK %	US %	#	SCK #	SCK %	US %
Emerging Sectors		27,022	3,844	16.6%	9.3%	3,240	3,022	11.2%	5.8%
Digital Network Services and Cybersecurity	● 0.40	2,409	967	67.0%	22.4%	644	618	25.6%	13.7%
Machinery & Metalworking	● 1.71	15,910	1,507	10.5%	3.2%	1,799	1,045	6.6%	2.6%
Petroleum-Based Products	● 1.98	1,338	709	112.7%	2.0%	679	419	31.3%	0.6%
Plastics & Composites	● 1.71	3,339	709	26.9%	8.5%	435	378	11.3%	-0.3%
Value-Added Products	● 1.67	4,025	(48)	-1.2%	8.4%	(317)	562	14.0%	5.1%
Legacy Sectors		102,804	(3,410)	-3.2%	8.2%	(7,699)	(707)	-0.7%	9.2%
Aerospace	● 3.35	33,968	(2,246)	-6.2%	11.3%	(1,382)	(3,680)	-10.8%	9.1%
Business Process Outsourcing	● 1.72	8,559	585	7.3%	9.9%	(404)	535	6.3%	8.2%
Crop and Animal Farming	● 0.71	3,124	(524)	-14.4%	3.1%	(597)	(135)	-4.3%	1.9%
Healthcare	● 1.01	38,937	(925)	-2.3%	8.7%	(4,305)	1,990	5.1%	12.0%
Logistics	● 0.99	10,210	(82)	-0.8%	11.2%	(978)	332	3.3%	6.0%
Production, Processing, and Distribution	● 1.92	2,673	(615)	-18.7%	-21.8%	(138)	(62)	-2.3%	2.9%
Transportation	● 0.95	5,332	398	8.1%	7.2%	105	312	5.9%	4.7%
Total		390,174	6,223	1.6%	7.6%	(21,317)	5,289	1.4%	5.8%

Source: Economic Modeling Specialists International (EMSI)

As in 2015, there are issues that "cross-cut" each of the target sectors. Principally, these include workforce, innovation, and infrastructure. These issues will be approached tactically in the Regional Growth Plan Implementation Guidelines. The Implementation Plan will then determine which the greater Wichita region entities will lead and support the activation of these strategies and ensure they are appropriate to each target sector and coordinated with the region's full complement of strategic implementation.

Advanced Manufacturing & Materials

DEFINITION: The Advanced Manufacturing and Materials target comprises two niches: machinery and metalworking and plastics and composites. Included in the machinery and metalworking niche are manufacturing establishments that produce a wide range of final products including agriculture machinery, industrial machinery, HVAC and other mechanical systems, engines and turbines, motor vehicle body and parts, and medical equipment and supplies, among others. Additionally, the niche includes establishments that perform work on a metal or metal product such as machine shops, coating, and other fabricated metal products. The plastics and composites niche comprise establishments and economic activities related to working with composites, advanced plastics and other advanced materials.

FIGURE 32: THE GREATER WICHITA REGION ADVANCED MANUFACTURING AND MATERIALS SECTOR ACTIVITY, 2012-2017

NAICS Subsector	2017		5-yr Chg. (2012-17)				Earnings	
	LQ	Jobs	#	%	KS %	US %	2017	% of US
Machinery & Metalworking								
3321 Forging & Stamping	● 0.97	230	5	2.2%	-20.2%	-1.5%	\$41,745	73.3%
3322 Cutlery & Handtool	● 0.56	52	13	34.0%	21.3%	-4.6%	\$37,633	63.7%
3323 Architectural & Structural Metals	● 1.70	1,556	63	4.2%	8.7%	8.2%	\$45,587	85.6%
3324 Boiler, Tank, & Shipping Container	● 0.93	204	47	29.8%	-5.2%	-6.2%	\$50,300	78.4%
3327 Machine Shops; Turned Product; & Screw, Nut, & Bolt	● 1.79	1,565	450	40.3%	10.0%	-3.2%	\$51,074	95.6%
3328 Coating, Engraving, Heat Treating, & Allied Activities	● 3.61	1,199	118	10.9%	8.4%	-0.4%	\$42,022	86.0%
3329 Other Fabricated Metal Product	● 1.23	816	49	6.4%	10.8%	-0.4%	\$45,761	74.2%
3331 Agriculture, Construction, & Mining Machinery	● 7.34	3,589	55	1.5%	-4.0%	-18.9%	\$55,216	75.4%
3332 Industrial Machinery	● 3.37	937	246	35.6%	16.5%	7.0%	\$61,763	73.8%
3333 Commercial & Service Industry Machinery	● 0.78	171	(94)	-35.3%	-8.9%	0.1%	\$60,332	81.8%
3334 Ventilation, Heating, AC, & Commercial Refrig. Equip.	● 5.02	1,602	398	33.1%	18.3%	3.0%	\$49,492	87.4%
3335 Metalworking Machinery	● 1.33	586	75	14.8%	9.8%	1.0%	\$52,430	86.9%
3336 Engine, Turbine, & Power Transmission Equipment	● 0.44	102	53	107.2%	18.1%	-6.3%	\$68,904	91.1%
3339 Other General Purpose Machinery	● 2.10	1,328	41	3.2%	3.8%	2.0%	\$55,992	82.3%
3362 Motor Vehicle Body & Trailer	● 0.83	311	(40)	-11.5%	-23.3%	20.1%	\$40,967	79.6%
3363 Motor Vehicle Parts	● 0.21	306	55	21.9%	18.5%	21.1%	\$56,200	95.6%
3391 Medical Equipment & Supplies	● 0.24	186	(33)	-15.1%	-9.3%	-0.3%	\$37,368	51.0%
3399 Other Miscellaneous	● 1.49	1,170	5	0.5%	13.5%	6.4%	\$45,506	90.3%
Plastics & Composites								
3252 Resin, Synthetic Rubber, & Artificial /Synthetic Fibers & Filaments	● 0.30	69	(12)	-14.6%	-27.2%	0.8%	\$42,008	46.5%
3261 Plastics Product	● 2.27	3,194	774	32.0%	16.8%	11.1%	\$45,437	87.2%
3262 Rubber Product	● 0.23	76	(53)	-41.1%	-12.0%	3.5%	\$40,877	72.2%
Total, Target Sector	● 1.71	19,250	2,216	13.0%	4.1%	4.1%		
Total, All Jobs		390,174	6,223	1.6%	2.7%	7.6%	\$42,394	81.1%

Source: Economic Modeling Specialists International (EMSI)

Note: Earnings ratio refers to the ratio of local earnings (wages plus supplements) to the national average for that same sector. This helps provide an important perspective on the relative cost of labor in a community. Location quotients (LQs) measure the relative concentration of regional employment in a given business sector. Specifically, they are calculated by dividing a sector's share of regional employment by that sector's share of national employment. A location quotient above 1.0 would indicate that the sector is more heavily concentrated in the region than it is nationally. Color-coding: Employment growth is color-coded such that growing sectors are presented in green text and declining sectors in red text. Those with location quotients greater than or equal to 1.1 are presented with a green dot. LQs lower than 0.9 are presented with a red dog and LQs between 0.9 and 1.1 with a yellow dot.

KEY LOCAL EMPLOYERS: Eaton Corporation; Goodman Manufacturing Co LP; Moridge Manufacturing Inc.; JR Custom Metal Products, Inc.; Trinity Precision; Central Plastics, Inc.; Johnson Controls; Johns Manville; Femco, Inc.; Silgan Dispensing Systems; Rubbermaid Home Products; Reiloy Westland Corporation; Western Industries Plastic Products LLC; Viegaⁱⁱ; Hehr International; Industrial Metal Fab; Future Foam; Century Plastics; Vornado; AGCO Corporation; Collins Industries; Kuhn Krause; Takako America; Siemens Wind Power; Tribine and Lowen Corp; among others.

REGIONAL OVERVIEW: Although the Advanced Manufacturing and Materials target is made up of a diverse set of activities and establishments, the processes involved in the production of the goods share similar workforces, inputs, and business climate needs, among other factors. The activities are supportive of each other and align with the workforce competencies and training capacity in the greater Wichita region. Many of the activities are also tied to the Aerospace sector to at least some degree. For example, composites have been developed for the aerospace industry, but have applications in a variety of industries. They are classified under advanced manufacturing given the opportunities and potential for strong economic growth beyond aerospace.

Overall, the target added over 2,000 jobs over the past five years and employment is projected to continue to grow over the next decade. The region has had success in growing a variety of manufacturing operations. For example, in March, Siemens Gamesa Renewable Energy announced they were rehiring 100 people at its Hutchinson manufacturing plant where it manufactures parts of wind turbines. The plant has averaged about 300 workers since it opened in 2010. Additionally, Johnson Controls' Wichita location has had rapid growth since 2015 and currently employs over 1,500 people. Employees design, engineer, and assemble residential heating and cooling products for distribution. The plant also includes a Highly Accelerated Life Testing (HALT) facility, which allows for simultaneous testing of up to 24 outdoor systems, simulating a five-year life in four months under a variety of real-life temperature, weather and live voltage conditions

NATIONAL TRENDS AND MARKET OUTLOOK: Nationally, the manufacturing sector in the United States suffered heavy losses during the Great Recession. In addition to the negative effect cause by the economic downturn, the decline was also brought about by increasing global competition, labor cost differentials, and automation, among other factors. Over the past five years, U.S. employment in Advanced Manufacturing and Materials has rebounded and employment is up 4.1 percent. Manufacturing remains an important part of the nation's economy, and data illustrates that it will continue to be an important source of wealth. It is also important to differentiate manufacturing employment from productive output. As an industry, manufacturing is innovating to compete globally; this typically results in increased output as formerly manned jobs are automated. Thus, productivity increases, but employment does not. This is good for the regional economy but does not accrue benefits equally to the production-oriented workforce.

There are numerous positive signs that support manufacturing growth in the United States. For instance, although large plants and developments make the headlines, many new projects represent smaller manufacturing projects with less than 100 jobs. As noted, while automation and other technological advancements have reduced the number of workers necessary to manufacture certain products, it has also shifted the scale of operations towards smaller facilities. Overall, the average size of a manufacturing

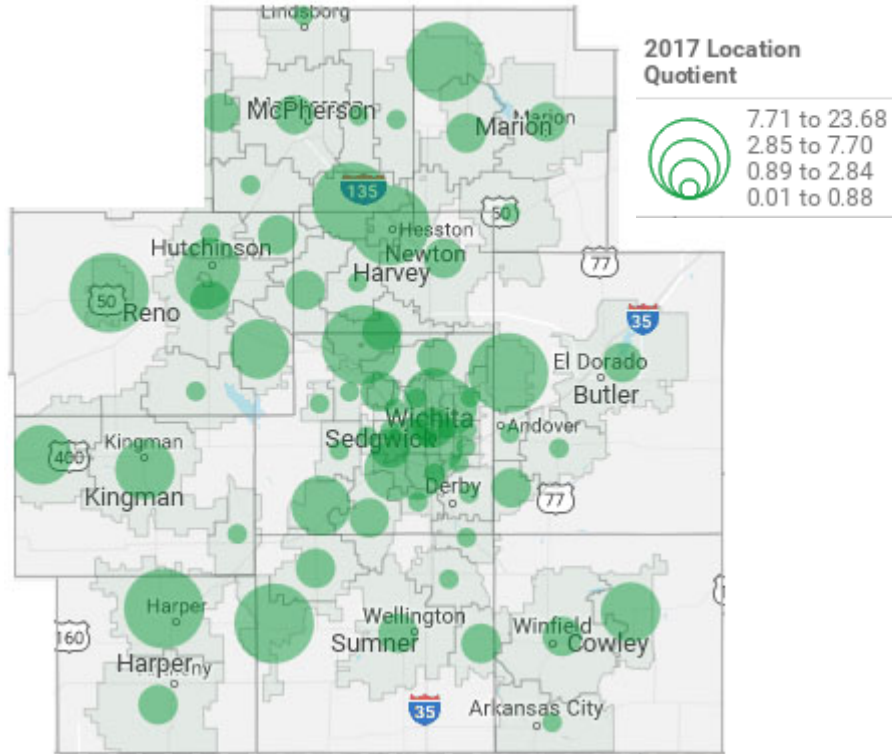
establishment was 36.1 employees in 2016, down from 39.2 in 2006. **These changes in production processes have also led to heightened educational and skill requirements for many production occupations.**

There is also the growing trend of companies “reshoring” manufacturing operations from other countries back to the United States that has helped to contribute to growth in new manufacturing operations across the country. Rising wages overseas have contributed to an erosion of labor-cost advantages in many regions. According to a report by the Manufacturing Institute and Deloitte, half of manufacturing company executives reported that they would consider reshoring by 2020.ⁱⁱⁱ

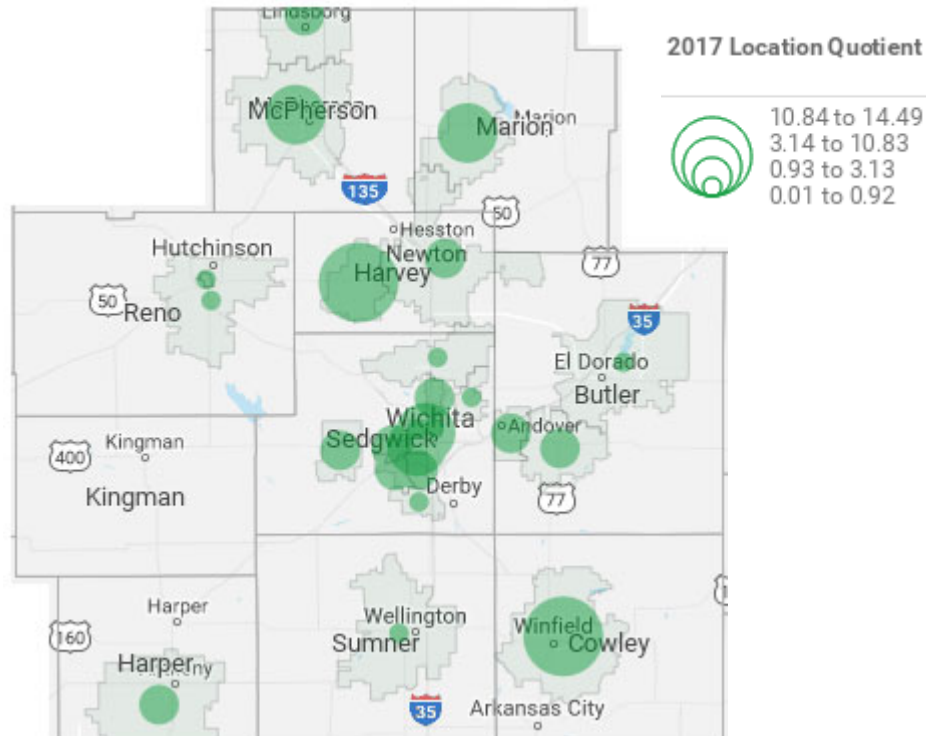
Employment in the Advanced Manufacturing and Materials target is projected to grow by 2.1 percent nationally over the next five years. Job growth will be driven by manufacturing of motor vehicle body and trailers; motor vehicle parts; architectural and structural metals; boiler, tank, and shipping containers; and other general purpose machinery. Employment within each of the subsectors is projected to increase by more than 4 percent. Although commercial and service industry machinery and cutlery and hand tool manufacturing is projected to experience job loss over the next five years, those subsectors were included in the Advanced Manufacturing and Materials target given the similar workforce competencies and transferable skills among employees.

GEOGRAPHIC DISTRIBUTION: Employment in the Advanced Manufacturing and Materials target and its two niches are widely dispersed across the ten-county greater Wichita region. However, Plastics and Composites is more concentrated than Machinery and Metalworking per the following maps.

FIGURE 33: GEOGRAPHIC CONCENTRATIONS OF MACHINERY AND METALWORKING NICHE



Source: Economic Modeling Specialists International (EMSI)

FIGURE 34: GEOGRAPHIC CONCENTRATIONS OF PLASTICS AND COMPOSITES NICHE


Source: Economic Modeling Specialists International (EMSI)

KEY FINDINGS AND STRATEGIC CONSIDERATIONS

- ✓ The greater Wichita region's strength in manufacturing operations can be seen in two key indicators: location quotients and five-year employment growth. Employment within the manufacturing target is 75 percent more concentrated than the average American community; the regional sector experienced faster than average growth over the past five years. Although there is some overlap with the Aerospace cluster, **the fact that total employment in the manufacturing sector was able to grow by 13 percent during a time with the local Aerospace cluster contracted by 6.2 percent is a testament to the strength and diversity of the region's manufacturing sector.** Regional manufacturing activities clearly reach beyond simply supporting the Aerospace cluster. For example:
 - Employment in Agriculture, Construction, and Mining Machinery is more than seven times more concentrated than the nation and grew during a time with employment within the sector declined statewide and nationally.
 - Industrial Machinery manufacturing has also experienced strong growth (+36.5 percent) and has an LQ of 3.37. Wages are roughly 46 percent higher than the regional average.
 - Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment manufacturing activities have a strong presence in the greater Wichita region. Employment

growth over the past five years outpaced both the state and national growth rates, total employment in the subsector is five times more concentrated locally.

- ✓ **Advanced Manufacturing and Materials offers quality employment opportunities for the local workforce.** Over 70 percent of the subsectors in the target offer average wages above the regional average for all jobs. At the same time, average annual wages across the subsectors in Advanced Manufacturing and Materials are below the national average, making the region an attractive destination for employers.
 - However, it should be noted that low wages can be a double-edged sword. Low wages are certainly beneficial from the employer’s perspective given the lower labor costs, but they can also make attracting and retaining workers difficult even with a lower cost of living.

- ✓ **The greater Wichita region has many resources and supporting institutions in place to help grow the Advanced Manufacturing and Materials target.** The region’s pre-K-12 and postsecondary institutions have a variety of programs and initiatives to support the greater Wichita region’s manufacturing sector. An example of some of the programs and initiatives supporting the manufacturing sector in the greater Wichita region includes:
 - WSU Tech, Hutchinson Community College, Cowley County Community College, and Butler Community College offer programs with degree and certificate options in manufacturing fields such as welding, machining, robotics, automotive, and maintenance.
 - In April 2018, Rubbermaid and the Kansas Department of Commerce supported a program to showcase exciting career opportunities in the manufacturing sector to students from Winfield Middle School. Robotics is emerging as a key component of manufacturing in household products and plastics containers. Rubbermaid hopes to get students interested in technology and Rubbermaid and to retain kids to have homegrown employees in the future.
 - WSU Tech has a high demand training program in Composite Technology where students are guaranteed an interview with Spirit AeroSystems upon completion. The program prepares students to work on aviation composite technologies through a well-rounded curriculum that includes hands-on experience in all the stages of the aircrafts life from design to production and repair. Students can apply their knowledge at the state of the art composite laboratory at NCAT. Coursework in the program includes CATIA, composite fabrication, composite repair and lean manufacturing.
 - The following list of completions provides a more detailed list of some of the core occupations that benefitted from the region’s talent pipeline between 2006 and 2016. Completions includes certificates, two-year degrees, and four-year and above degrees.
 - Mechanical Engineering: 1,013 completions
 - Welding Technology/Welder: 842 completions

- Automobile/Automotive Mechanics Technology/Technician: 558 completions
 - Mechanical Engineering/Mechanical Technology/Technician: 500 completions
 - Machine Tool Technology/Machinist: 320 completions
 - Plastics and Polymer Engineering Technology/Technician: 216 completions
- ✓ **The Region's workforce is a clear competitive advantage for attracting and growing Advanced Manufacturing and Materials jobs in the greater Wichita region.** The region possesses a high concentration of jobs in several key occupations. While this is undoubtedly influenced by the Aerospace sector, the same core set of skills and competencies can be leveraged for additional growth within this target. It is also a testament to the region's established training institutions and talent pipeline. The following list of occupations is a sample of some of these common occupations and the relevant data regarding their presence in the greater Wichita region's workforce.
- Coating, painting, and spraying machine setters, operators, and tenders: There are nearly 600 workers within this occupational group in the region and employment has increased by 8.7 percent over the past five years, a growth rate faster than that of the state and nation. Its location quotient is 2.7 and the average hourly wage was \$15.77 in 2017.
 - Machinists: the greater Wichita region has over 2,100 machinists in the region. The concentration of machinists is more than two times than of an average American community. Employment growth (+6.2 percent) outpaced the growth rate in Kansas (+4.6%) and the United States (+4.7%) between 2012 and 2017. In 2017, the average hourly was \$20.40.
 - Welders: With a location quotient of 1.81, there are roughly 1,800 welders in the greater Wichita region. Employment increased by 2.8 percent, slightly slower than the national employment growth of 3.4 percent. This is likely tied to the downturn of the aerospace sector. The average hourly was \$19.81 in 2017.
- ✓ **While NIAR's principal focus is on the aviation industry, its mission is also to assist non-aviation industries that may benefit from aviation-related technologies.** With approximately 320,000 square feet of research and office space, the institute is home to more than a dozen labs including Additive Manufacturing, Advanced Coatings, Center of Innovation for Biomaterials in Orthopedic Research, Composites & Advanced Materials, Computational Mechanics, Research Machine Shop, Reverse Engineering, Robotics and Automation, and Virtual Reality.
- ✓ **WSU's Innovation Campus's Experimental Engineering Building (EEB) houses 25 laboratories for research, instruction and design, and GoCreate, the community's makerspace.** The space provides a project-based experimental learning environment in engineering. Additionally, one of the largest 3D printers ever manufactured is housed in the building.

FIGURE 35: ADVANCED MANUFACTURING AND MATERIALS SUBSECTOR EXPORTS, 2017

NAICS	Industry	Exports
3331	Agriculture, Construction, & Mining Machinery Mfg.	\$1,171,217,154
3261	Plastics Product Mfg.	\$762,228,397
3334	Ventilation, Heating, Air-Conditioning, & Commercial Refrigeration Equip. Mfg.	\$393,978,844
3339	Other General Purpose Machinery Mfg.	\$364,481,764
3323	Architectural & Structural Metals Mfg.	\$248,788,999
3332	Industrial Machinery Mfg.	\$204,249,350
3327	Machine Shops; Turned Product; & Screw, Nut, & Bolt Mfg.	\$198,850,680
3399	Other Miscellaneous Mfg.	\$192,753,970
3328	Coating, Engraving, Heat Treating, & Allied Activities	\$187,857,251
3329	Other Fabricated Metal Product Mfg.	\$97,680,077
3363	Motor Vehicle Parts Mfg.	\$95,846,191
3335	Metalworking Machinery Mfg.	\$89,244,065
3362	Motor Vehicle Body & Trailer Mfg.	\$70,399,130
3321	Forging & Stamping	\$53,405,798
3252	Resin, Synthetic Rubber, & Artificial & Synthetic Fibers & Filaments Mfg.	\$44,330,823
3336	Engine, Turbine, & Power Transmission Equipment Mfg.	\$42,467,250
3324	Boiler, Tank, & Shipping Container Mfg.	\$41,684,739
3333	Commercial & Service Industry Machinery Mfg.	\$31,913,947
3391	Medical Equipment & Supplies Mfg.	\$13,864,071
3262	Rubber Product Mfg.	\$11,564,028
3322	Cutlery & Handtool Mfg.	\$1,843,773
Total Target Exports		\$4,318,650,300

Source: Economic Modeling Specialists International (EMSI)

Note: The export figures show the amount of money that is spent by industries located outside the region in exchange for goods or services produced by each industry located in the region. Exports include both foreign and domestic.

- ✓ CEDBR's "Wichita in Metropolitan America: An Analysis of Wichita's Potential Export Markets,"^{iv} reported that many of the region's goods-producing industries in the **advanced manufacturing sector offer quality export opportunities to nearby metropolitan areas**. CEDBR identified a number of opportunities, including the following:
 - Given Denver's economic activity in the concrete pipe manufacturing industry, Wichita's potential export market for its coating and engraving businesses was \$1.3 million to Denver. Likewise, it reported that Wichita had a potential export market of \$57.8 million for its coating and engraving sector and \$5.5 million for its machine shops.
 - The report also identified several export opportunities to St. Louis. Plate work, machine shops, screw and nut manufacturing, coating and engraving, and metal cutting machine tool manufacturing can meet a higher share of St. Louis; input needs. The export market potential

to St. Louis' plate work manufacturing companies and economic activity for the five sector inputs was roughly \$75.7 million.

- There were several other export opportunities to other nearby metros that were identified for Wichita's advanced manufacturing and materials sector. For a full list, the report can be found at http://www.cedbr.org/content/2015/wichita_megapolitan.pdf.
- ✓ Composite materials are used by the aerospace industry to reduce aircraft weight while maintaining the strength, durability, and quality of heavier metals. Boeing's 787 Dreamliner and the Airbus A350 XWB are now made up of more than 50 percent composite materials. **In addition to the aerospace cluster, demand for composite materials is projected to grow in automotive manufacturing, wind energy and transportation sectors due to increased demand for lightweight and fuel-efficient vehicles.** Composite materials have high heat resistance, low density, greater corrosion resistance and fatigue resistance, among other advantages. One example of an advanced composite used by aircrafts such as Airbus is carbon-fiber reinforced plastic (CFRP). The material is made up of carbon fibers locked in place with plastic resin, making it lighter than aluminum and stronger than iron.
 - According to TechSci Research's report, "Global Composites Market By Type, By Application, By Manufacturing Process, By Region, Competition Forecast & Opportunities, 2012-2022", **the composite market is projected to reach \$42 billion by 2022^v.**^{vi} The global carbon fiber market is projected to grow at a CAGR of 5.9 percent from 2018 to 2023.
 - NIAR is home to the FAA Center of Excellence for Composites and Advanced Materials (CECAM) and the National Center for Advanced Materials Performance (NCAMP), which is funded through the FAA and Air Force Research Laboratory.
- ✓ **While the Advanced Manufacturing and Materials target is projected to expand over the coming decade, one barrier that looks to threaten this growth will be the lack of skilled labor.** The region's tight labor market and aging workforce, combined with challenges in getting youth interested in technical careers, could stifle some of the projected growth.
- ✓ Although automated and autonomous mobility technologies are being developed and piloted, **manufacturers – especially smaller firms – are slow and hesitant to adopt and buy-in to the new technologies.** According to the recent PwC and the Manufacturing Institute's Industrial Mobility report, most manufacturers are hesitant to adopt autonomous mobility solutions. Manufactures cited several barriers to adoption such as high costs, technology not being mature enough, safety issues, and lacking the skills to adopt and exploit semi-autonomous/autonomous mobility technology. When asked what factor would most likely prompt their company to adopt advanced industrial mobility technologies, 86 percent said once it was a cost advantage and 47 percent stated that customer and supply chain requirements and expectations.
- ✓ Stakeholders from the manufacturing sector in the greater Wichita region noted that the region is typically slow to adopt new technologies. Moving forward, it will be important that local employers

have the resources they need to remain competitive as technology advances and transforms industries.

Aerospace

DEFINITION: From its beginnings over a century ago in Greater Wichita, Aerospace has grown to become the region's only true globally competitive cluster. This cluster includes production operations and aviation-related services, including the manufacturing, maintenance, research and development, training, and other activities that are related to aviation and aerospace operations. The Aerospace sector in the greater Wichita region is primarily focused in 1) Design & Production and 2) Maintenance, Repair, and Overhaul (MRO).^{vii} These niche segments are intended to inform Aerospace development and support strategies but cannot be differentiated by employment code. Both the initial design and production of Aerospace parts and products and their maintenance, repair, and overhaul are comprised of the same NAICS codes. Thus, the greater Wichita region's Aerospace target is defined as a single category in the following employment table.

FIGURE 36: THE GREATER WICHITA REGION AEROSPACE SECTOR ACTIVITY, 2012-2017

NAICS	Subsector	2017		5-yr Chg. (2012-17)				Earnings	
		LQ	Jobs	#	%	KS %	US %	2017	% of US
334220	Radio & Television Broadcasting & Wireless Communications Equipment Mft.	1.30	157	42	36.3%	-78.6%	-20.7%	\$72,815	67.5%
334417	Electronic Connector Mft.	1.60	81	34	73.0%	325.5%	9.5%	\$46,825	68.1%
334419	Other Electronic Component Mft.	0.87	131	(127)	-49.1%	-26.5%	-8.7%	\$39,907	56.0%
334511	Search/Detection/Navig./Guid/Aeronautical, & Nautical System & Instr. Mft.	1.91	564	(55)	-8.9%	-16.4%	-9.9%	\$61,275	53.6%
334515	Instrument Mft. for Measuring & Testing Electricity & Electrical Signals	3.79	345	(85)	-19.7%	-15.3%	-9.5%	\$71,765	66.8%
334519	Other Measuring & Controlling Device Mft.	0.95	85	(3)	-3.7%	-30.4%	4.5%	\$52,951	61.2%
336411	Aircraft Mft.	39.60	21,823	(2,951)	-11.9%	-11.9%	-5.1%	\$85,923	79.6%
336412	Aircraft Engine & Engine Parts Mft.	4.17	811	(204)	-20.1%	-17.0%	-0.4%	\$82,571	89.9%
336413	Other Aircraft Parts & Auxiliary Equipment Mft.	20.51	5,402	(122)	-2.2%	6.7%	2.3%	\$52,617	72.0%
488190	Other Support Activities for Air Transportation	2.74	754	91	13.8%	21.4%	13.8%	\$48,105	79.6%
541330	Engineering Services	0.62	1,485	114	8.3%	12.0%	5.2%	\$81,000	86.9%
541380	Testing Laboratories	0.93	378	109	40.2%	5.1%	4.2%	\$59,456	78.2%
Total, Target Sector		6.56	32,016	(3,158)	-9.0%	-8.8%	1.3%		
Total, All Jobs			390,174	6,223	1.6%	2.7%	7.6%	\$42,394	81.1%

Source: Economic Modeling Specialists International (EMSI)

Note: Earnings ratio refers to the ratio of local earnings (wages plus supplements) to the national average for that same sector. This helps provide an important perspective on the relative cost of labor in a community. Location quotients (LQs) measure the relative concentration of regional employment in a given business sector. Specifically, they are calculated by dividing a sector's share of regional employment by that sector's share of national employment. A location quotient above 1.0 would indicate that the sector is more heavily concentrated in the region than it is nationally. Color-coding: Employment growth is color-coded such that growing sectors are presented in green text and declining sectors in red text. Those with location quotients greater than or equal to 1.1 are presented with a green dot. LQs lower than 0.9 are presented with a red dog and LQs between 0.9 and 1.1 with a yellow dot.

KEY LOCAL EMPLOYERS: While some companies are involved in the design and production of aircraft and aircraft parts and perform in-house maintenance, repair, and overhaul of aircrafts and aircraft systems, other are solely third-party MRO providers. The following list attempts to differentiate the two niches by company, recognizing that there is some overlap between the two niches. The list categorizes the companies based on their primary business activities and is meant to simply illustrate the existing capacity and economic activity occurring in the greater Wichita region.

- **Design and Production:** Airbus, Bombardier Learjet, Capps Manufacturing, Cobham AvComm, Cox Machine Inc., Globe Engineering Company, Harlow Aerostructures LLC, HM Dunn AeroSystems Inc.,

LTC – Leading Technology Composites, Inc., Mid-Continent Instruments and Avionics, Spirit AeroSystems, Textron Aviation, Sigma Tek; D-J Engineering; Park Electro Chemical Corporation; Avcon Industries; and TECT Aerospace, among others.

- **Maintenance, Repair, and Overhaul (MRO):** Aero Interior Maintenance, Inc., Air Plains Service, GlobalParts.aero, National Metal Finishing Company, Mid-Continent Aviation Services, Inc., Midwest Aircraft Services Inc., Midwest Corporate Aviation, Midwest Malibu Center, Inc., Signature Flight Support Corporation, Wichita Air Services Inc., and Yingling Aviation, among others.

REGIONAL OVERVIEW: As the Air Capital of the World, Wichita truly can stake claims as having one of the most robust Aerospace clusters on the planet. For over one hundred years, the greater Wichita region has been manufacturing aircraft products and parts, evolving the regional industry into a sophisticated, comprehensive network where today, Wichita delivers over 40 percent of all general aviation planes built in the nation. The talent pipeline, training resources, large employers, pro-aviation business environment, supply chain network, and research and development activities make the greater Wichita region a leader in the aerospace field.

However, the region suffered heavy losses in the cluster between 2009 and 2012, particularly in 2011. The downturn in the economy cut demand and led to layoffs and closures at OEMs and their supply chains. As an example, during its consolidation phase, Textron eliminated many duplicative positions between Cessna and Beechcraft in order to reduce costs and improve quality and efficiencies. In the end, by some estimates the greater Wichita region's aerospace sector lost around 30,000 jobs. Many of those employees left the community following the layoffs.

While the Aerospace sector has stabilized in recent years, it has forever changed the landscape of the Air Capital of the World. Many of the experts in the aerospace sector in Wichita say that general aviation will never return to what it was and that today's local aerospace cluster must adjust to a new "normal." They note that the last recession created permanent structural changes in the region's Aerospace cluster – most prominently in the more mature general aviation segment – that resulted not only in layoffs but also a lasting shift to lower-cost employee options like WSU students accessed via relationships with the university on its Innovation Campus. As the greater Wichita region moves forward and aerospace and aviation companies adjust their business models, input respondents said one thing is certain: an available, skilled workforce is the cluster's top priority.

NATIONAL TRENDS AND MARKET OUTLOOK: As with the overall manufacturing sector, Aerospace employment in the U.S. suffered losses during the recessionary years but has rebounded slightly. Between 2006 and 2016, jobs in aerospace product and parts manufacturing increased by 3.3 percent. Historically, the aerospace industry has been concentrated in just a few larger centers, such as Seattle and Wichita, but in recent years, the industry has been decentralizing with job growth occurring in many other communities. Employment in aerospace product and parts manufacturing has grown significantly in places like Cincinnati, Waco, and Oklahoma City. Total U.S. exports of aircraft parts reached \$56.2 billion, a record amount in 2014. It represented a 10.6 percent increase from 2013. In comparison, total exports from the U.S. increased by 2.6 percent.^{viii}

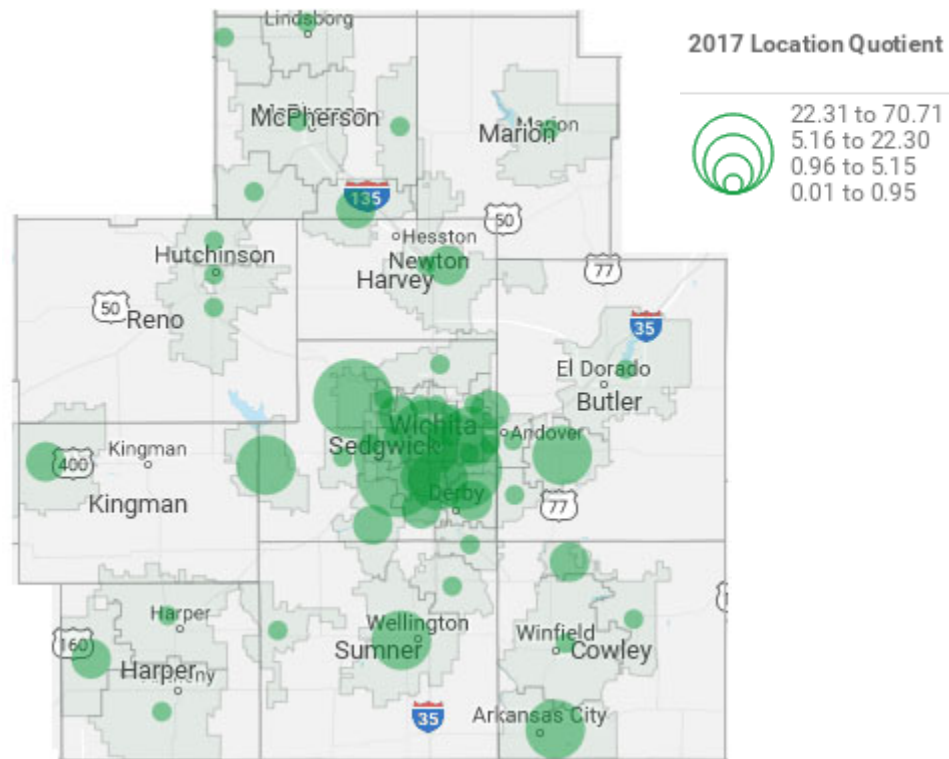
Constant innovation and new technological advancements that improve safety, efficiency, and the quality of components and parts have helped to drive growth within the sector. For example, information technology is helping to increase efficiencies in MRO operations using mobile devices to speed up work flow, while aircraft health management and predictive maintenance are used to improve productivity and efficiency. Boeing predicts that augmented reality will soon be used to assist MRO tasks that are complicated or usual and that additive manufacturing will enable part to be printed as-needed, thereby minimizing inventory needed by MRO operators. Additionally, it will increase the speed of delivery and scope of their services to a wider range of aircrafts since less time will be spent waiting for replacement parts.^{ix}

The 2017 Global aerospace and defense outlook produced by Deloitte expects growth within the sector will continue to be strong.^x Defense budgets in several nations have increased in recent years as demand for defense and military products has grown. This has primarily been driven by increased national security threats and rising global tensions. The commercial aerospace subsector is also expected to have above-average growth rates, driven by increased passenger travel demand, lower commodity prices, and an accelerated equipment replacement cycle. Given that the lifespan of an aircraft is typically between 20 and 30 years, MRO operations are a necessary piece to the aerospace world.^{xi} Airbus' Global Market Forecast projects that the commercial aircraft upgrades services market will grow to \$180 billion over the next 20 years.

Greater Wichita's aerospace cluster is currently largely concentrated in general aviation as opposed to military and scheduled commercial aviation. Globally, general aviation manufacturers delivered over \$23.9 billion in new aircraft in 2017, down from \$24.8 billion in 2016. Business jet airplane deliveries grew slightly by 1.3 percent. However, total general aviation airplane shipments peaked in 2007 with 4,277 shipments worldwide; in 2017, there were 2,324 shipments. Business jets peaked in 2008 with 1,317 shipments worldwide; in 2017 there were 676 shipments.^{xii} U.S. manufacturers of general aviation aircraft delivered 1,596 aircraft in calendar year 2017, a 4.2 percent increase from the previous year.

The FAA produces an annual 20-year forecast to predict future demand in aerospace and aviation. The FAA Aerospace Forecast for 2018-2038 projects that the long-term outlook for general aviation will be driven by turbine aircraft activity. Fixed wing piston aircraft, meanwhile, is projected to shrink at an average annual rate of -0.8 percent. Overall, the industry will be stable with the active general aviation fleet remaining around its current level. Increases in the turbine, experimental, and light sport fleets will be offset by declines in the fixed-wing piston fleet. Commercial air carriers had a more positive outlook. The report forecasts that the number of U.S. airline passengers will increase by more than 50 percent between 2018 and 2038. The greater Wichita region's Aviation cluster has seen these trends demonstrated in the growing demand for its commercial aircraft focused operations while general aviation orders have not kept pace.

GEOGRAPHIC DISTRIBUTION: Aerospace employment both overall and in its two niches is well distributed across the ten-county greater Wichita region as the following maps attest. Production and Maintenance is more concentrated in the region's central counties while Navigation Systems is more dispersed.

FIGURE 37: GEOGRAPHIC CONCENTRATIONS OF AEROSPACE


KEY FINDINGS AND STRATEGIC CONSIDERATIONS

- ✓ **The region's workforce is a significant competitive advantage that the greater Wichita region possesses for attracting, growing, and expanding economic activity in Aerospace.** Many of these occupations have transferable skills that can easily be applied to both Design and Production companies and MRO establishments. The following list of occupations is a sampling of some of these common occupations in manufacturing and relevant data and findings regarding their presence in the greater Wichita region workforce:
 - **Aircraft Structure, Surfaces, Rigging, and System Assemblers:** There are over 3,500 jobs in this occupation in the greater Wichita region. Its location quotient is an extraordinary 36.48. Out of 933 metropolitan and micropolitan statistical areas in the United States, only the Ozark, Alabama micropolitan has a higher concentration of workers in this occupation than the Wichita metro area. Better comparisons are the metropolitan areas of Seattle and Savannah: Seattle's location quotient for aircraft structure assemblers is 22.08 while Savannah's is 21.03.
 - **Layout Workers, Metal and Plastic:** These workers reference points and dimensions on metal or plastic stock or workpieces, such as sheets, plates, tubes, structural shapes, castings, or

machine parts, for further processing. In the greater Wichita region there are roughly 650 jobs in this occupation, roughly 30 times more concentrated than the average community.

- Aerospace Engineers: There are more than 2,000 aerospace engineers in the region. These jobs pay well with average hourly earnings of \$48.64. Employment in this occupation is down locally which is tied to the overall downturn in the cluster. However, employment for aerospace engineers is projected to grow by two percent over the next five years.
 - Avionics Technicians: there are roughly 620 jobs in this occupation with a location quotient of 14.05. Between 2012 and 2017, employment in this occupation fell by 5.4 percent, but grew by 6.5 percent, nationally.
 - Aircraft Mechanics and Service Technicians: There are over 1,000 jobs in the greater Wichita region, over three times the national average (LQ=3.21). Workers in this occupation diagnose, adjust, repair, or overhaul aircraft engines and assemblies, such as hydraulic and pneumatic systems. Includes helicopter and aircraft engine specialists.
- ✓ It is crucial that the greater Wichita region sustain its competitive advantage in Aerospace by adapting to changes in the industry and leading the way in technological advancements. The region has taken a number of steps to solidify and strengthen its ability to grow jobs and increase economic activity in the aerospace field.
- ✓ **NIAR offers tremendous opportunities to grow and expand economic activity related to aviation.** Its mission includes conducting research, transfer technology and enhance education for the purpose of advancing the nation's aviation industry. With approximately 320,000 square feet of research and office space, the institute is home to more than a dozen labs including Additive Manufacturing, Advanced Coatings, Aging Aircraft, Ballistic and Impact Dynamics Research Lab, CAD/CAM, Composites & Advanced Materials, Computational Mechanics, Crash Dynamics, Environmental Test, Full-Scale Structural Test, Mechanical Test, Nondestructive Test, Research Machine Shop, Reverse Engineering, Robotics and Automation, Virtual Reality and the Walter H. Beech Wind Tunnel.
- Wichita State University ranked fifth in national higher education R&D expenditures in aerospace, aeronautical, and astronautically engineering. In fiscal year 2016, WSU's expenditures in aerospace R&D were nearly \$44 million.
- ✓ The greater Wichita region's location is a strength for the aerospace cluster. Its central location, railroad access, and position on the I-35 corridor is a competitive advantage for moving aerospace products and parts across the country. Additionally, Wichita Dwight D. Eisenhower Airport has large aerospace manufacturing facilities, easy connectivity to other major metros, and the space and accessibility for MRO operations.

FIGURE 39: THE GREATER WICHITA REGION ACCESSIBILITY

 Source: www.aircapitaloftheworld.com

- ✓ The **National Center for Aviation Training (NCAT)** is another significant asset that the region can leverage to support growing aerospace jobs in the greater Wichita region. The training facility – among the only of its kind in the world – provides students the opportunity to receive hands-on, real-world training in the areas of general aviation manufacturing and aircraft and power plant mechanics. NCAT consists of three buildings: An Advanced Manufacturing Technology Center (80,948 sq. ft.), the Aviation Service Center (96,243 sq. ft.) and an Assessment and Administration Center (30,435 sq. ft.) for admissions, student services, and employment placement. To meet the critical shortage of skilled aviation workers, program development includes:
 - Aerostructures
 - Aerospace Coatings and Paint Technology
 - Aerospace Fiber Optics and Data Cable Installation
 - Aerospace Quality Control
 - Applied Science of Aviation Interiors
 - Applied Science of Aviation Manufacturing
 - Aviation Maintenance Technology
 - Avionics Technology
 - CAD/CAM: CATIA/ ENOVIA

- Composites Technology
- Nondestructive Testing
- ✓ **Greater Wichita has a strong talent pipeline with multiple training resources available locally.** In addition to NCAT, Wichita State offers degrees in Aerospace Engineering, Industrial Engineering, Mechanical Engineering, Computer Engineering, and Computer Science. The University of Kansas also offers undergraduate and graduate programs in Aerospace Engineering. Overall, there were roughly 4,200 completions in engineering, engineering technologies, and engineering-related fields from the region's higher education institutions between 2011 and 2016. Completions at all award levels includes certificates, two-year degrees, and four-year and above degrees.
 - A new Aviation Pathway was recently announced by Wichita Public Schools, WSU Tech, and Textron Aviation. Once approved, it will be the state's first aviation technical education pathway. The pathway will enable high schoolers to receive their high school diploma and a technical certificate at graduation, enabling students to have immediate employment within the aviation industry upon graduation.
 - In Maize, students at USD 266 spent the 2017-18 school year building an airplane. High school students worked on an RV-12 kit plane as part of the global Airbus Foundation Flying Challenge program with support by Airbus, Tango Flight, WSU Tech, and others.
 - The Workforce Alliance of the greater Wichita region launched its Youth Employment Project initiative and has encouraged area companies to hire high school and college students for summer jobs. In 2017, Spirit hired about 20 students from the area's high schools to participate in its Summer High School Manufacturing Program with hopes that it will help to spur students' interest in local manufacturing careers. The program was considered successful and garnered a great deal of positive feedback. In 2018, Spirit has plans to double its number of high school interns in Wichita for its summer program. Likewise, Textron plans to house 25 interns through the Youth Employment Project this summer.
 - The greater Wichita region higher education institutions have trained thousands of students for the region's aerospace cluster. The following list of completions provides a more detailed list of some of these common, core occupations that have benefited from the region's talent pipeline between 2006 and 2016.
 - Electrical and Electronics Engineering, 1,306 completions
 - Mechanical Engineering, 1,013 completions
 - Airframe Mechanics and Aircraft Maintenance Technology/Technician, 970 completions
 - Aerospace, Aeronautical and Astronautical/Space Engineering, 707 completions
 - Aeronautical/Aerospace Engineering Technology/Technician, 351 completions

- ✓ **Aerospace is a tremendous source for new wealth.** According to EMSI, the greater Wichita region exported nearly \$11 billion in aerospace products and parts combined to domestic and foreign customers in 2017, by far the region's largest export sector. Aerospace has a huge economic impact that ripples through the economy.
 - For example, per the 2016 Kansas Aviation Economic Impact report, FlightSafety estimated that more than 12,000 clients come to one of Wichita's Learning Centers for some type of training each year.^{xiii} FlightSafety International is the world leader in professional aviation training and simulation systems. In total they have more than 1,800 professional instructors and complete more than 1.3 million hours of training each year. There are 4,000 courses for pilots, technicians, flight attendants and dispatchers, 100 eLearning and Live Learning courses, and more than 300 full flight simulators and advanced training devices in their Learning Centers. The total economic impact of its clients on Greater Wichita is estimated to be \$31 million.
 - In 2016, Kansas exported over \$2 billion in aircraft, spacecraft, and parts – the leading commodity exported by the state. Overall, aircraft, spacecraft, and parts exports accounted for roughly 20 percent of the state's total foreign exports.
- ✓ However, a recently report by the Brookings Institution highlights possible threats to local growth in Aerospace. The Brookings Export Monitor estimates goods and services exports as part of a Global Cities Initiative, which seeks to strengthen the international competitiveness and connections of cities and metro areas. The report found that metro areas that specialize in aircraft, travel and tourism, and pharmaceutical exports have shown much slower growth in 2017 than other metropolitan areas. According to the report, "The steepest annual export declines occurred in Toledo (-4.1 percent), Wichita (-4.1 percent), Seattle (-3.5 percent), and Honolulu (-3.8 percent)."^{xiv} Additionally, the report highlighted that any potential US-China trade war could leave Wichita and other areas that specialize in agriculture, aerospace, and automotive manufacturing more exposed to Chinese tariffs. Brookings estimated that 8.6 percent of export-supported employment, or 2,900 jobs, would be affected by a tariff. Greater Wichita had the largest share of tariff-affect export jobs out of any of the metros.
- ✓ A skilled and talented workforce is a top site selection component that is driving location decisions. For 32 years, *Area Development* has asked business executives about the most important considerations that influence their company's location decisions. In the most recent version published in February 2018, 88.8 percent of respondents ranked the "availability of skilled labor," as important or very important. It ranked third among the top site selection factors, coming in above occupancy or construction costs, state and local incentives, and corporate tax rates.
 - In the 2018 Regional Growth Plan Strategic Survey, nearly half of respondents felt that the region's availability of skilled labor was a "significant disadvantage" or "disadvantage." While the region's training institutions are some of the best for aerospace, their ability to train students is limited to the number of students that are enrolled. Stakeholders from the aerospace industry (among others) expressed concern about recruiting other employers to the region when the existing companies are having a hard time filling positions.

- ✓ **FirePoint is a new partnership between Wichita State University and the Army's Aviation and Missile Research, Development, and Engineering Center (AMRDEC) aimed at increasing the speed of development and production of new technology.** The partnership is two-year agreement for \$1.9 million and will be overseen by the FirePoint Innovations Center, which is housed on WSU's Innovation Campus in the Experiential Engineering Building. WSU researchers and students will work the Army's aviation and missile organization on joint projects and to accelerate technology transfer and commercialization between the center, universities, industry, and other government organizations. An example of one of the focus areas is technologies around future vertical lift.
- ✓ **Spirit AeroSystems and Wichita State University recently announced a new collaboration agreement focused on accelerating research and development and improving workforce training services in the area.**^{xv} The agreement establishes a new, innovative relationship with Spirit through NIAR and WSU Tech. The strategic focus is on applied learning opportunities for WSU students, joint strategic research projects, and improved training services to meet the workforce demands of the aerospace industry.
 - Spirit is experiencing increased production rates and recently launched a growth initiative in fabrication and defense. By co-locating at WSU, Spirit can collaborate on advanced composites R&D, rapid prototyping, product development and testing, and additive manufacturing and design with the university's research labs and activities.
- ✓ The 3D EXPERIENCE Center, a partnership between Dassault Systèmes and NIAR at WSU is a 22,000-square foot facility whose mission is to accelerate innovation by connecting top researchers, corporation, and laboratories. The center enables companies to engage in advanced product development and the manufacturing of next-generation materials and technologies.
 - OPTIS, a global virtual prototyping company, recently announced the opening of its virtual reality lab. The lab provided the VR component of the state-of-the-art virtual and advanced prototyping facility, which includes technologies from VR to 3D printing robotics. The VR lab enables users to explore new designs in full immersive 3D environments so that they can experience their designs and see the results of multiple simulations.
- ✓ One key emerging technology with strong promise for Aerospace is the use of Unmanned Aircraft Systems (UAS), commonly referred to as drones. Demand will be driven by increased applications and usage of UAVs in various commercial applications such as monitoring, surveying and mapping, precision agriculture, aerial remote sensing, and product delivery, in addition to the growth in usage of military UAVs worldwide. The FAA expects the number of UAS to more than double over the next five years. Commercial, small non-model UAS fleet is set for even stronger growth and is expected to more than triple over the next five years, going from 110,604 drones in 2017 to 451,800 in 2022.
 - The Kansas Department of Transportation was recently selected to be one of the ten participants for the United States' UAS Integration Pilot Program. The program is aimed at exploring the safe integration of drone operations and will serve as the basis of a new regulatory framework to safely integrate drones into the nation's airspace. The Kansas

Department of Transportation proposal stated that it will focus on beyond visual line of sight (BVLOS) operations in rural communities and will work with the FAA, KDOT, and private sector participants, such as UAS operators or manufactures, to collect the data. The program will leverage statewide unmanned traffic management system to facilitate precision agriculture operations. The Greater Wichita Partnership is involved in this pilot program.

- ✓ New technologies such as 3D printing will transform the production processes at Aerospace OEMs and Tier 1 suppliers. They will also benefit Tier 2 and 3 suppliers which are typically smaller firms under greater cost pressure than larger producers. Recently, General Electric (GE) successfully tested its first 3D-printed commercial aircraft engine called the Advanced Turboprop, or ATP. GE is now moving from design and development to the next phase of the program, ending with certification. More than 30 percent of the ATP is 3D-printed from advanced alloys. The ATP was recently chosen by Textron Aviation to power its new plane, the Cessna Denali.^{xvi}
 - Per GE Reports, “3D printing and dozens of other new technologies used for the first time in a civilian turboprop engine allowed the team to combine 855 separate components into just 12, shave off more than 100 pounds in weight, improve fuel burn by as much as 20 percent, give it 10 percent more power and simplify maintenance.”
 - As noted previously, 3D will also enable MRO operators to print parts as-needed, which will increase their speed of service and reduce inventory expenses. Additive manufacturing will also enable companies to print a wider range of parts that previously may have been difficult to obtain such as those in older aircraft.

Agriculture

DEFINITION: The Agriculture target consists of two niches: Crop and Animal Farming and Value-added Products. The Crop and Animal Farming segment comprises establishments such as farms, orchards, ranches, and feedlots. Firms are primarily engaged in growing crops and plants and grazing, breeding, or feeding animals. The Crop and Animal Farming niche also includes all the support activities for agriculture and animal production such as crop harvesting. The Value-added Products niche is composed of the value-added agriculture operations such as dairy products and animal slaughtering, in addition to ethanol and oilseed processing. Value-added agriculture is seen as the stronger growth opportunity for the sector.

FIGURE 40: THE GREATER WICHITA REGION AGRICULTURE SECTOR ACTIVITY, 2012- 2017

NAICS	Subsector	2017		5-yr Chg. (2012-17)				Earnings	
		LQ	Jobs	#	%	KS %	US %	2017	% of US
Crop and Animal Farming									
1110	Crop Production	● 0.73	1,469	(395)	-21.2%	-12.2%	0.4%	\$31,301	101.9%
1120	Animal Production	● 1.02	1,077	(143)	-11.7%	-3.2%	1.1%	\$43,674	130.6%
1151	Support Activities for Crop Production	● 0.46	551	23	4.3%	4.9%	9.8%	\$26,685	89.1%
1152	Support Activities for Animal Production	● 0.27	28	(8)	-23.0%	11.3%	4.3%	\$26,130	78.0%
Value-added Products									
3112	Grain and Oilseed Milling	● 2.39	356	6	1.8%	15.0%	1.3%	\$58,575	79.4%
3115	Dairy Product Manufacturing	● 1.16	405	69	20.4%	21.4%	7.1%	\$58,448	99.3%
3116	Animal Slaughtering and Processing	● 2.07	2,554	(253)	-9.0%	1.2%	4.2%	\$55,312	139.2%
3119	Other Food Manufacturing	● 1.05	551	105	23.4%	10.3%	23.5%	\$58,329	105.5%
3274	Lime and Gypsum Product Manufacturing	● 2.80	99	48	94.7%	28.6%	2.5%	\$48,921	72.3%
325193	Ethyl Alcohol Manufacturing	● 0.01	<10	N/A	N/A	16.6%	7.0%	Insf. Data	N/A
325199	All Other Basic Organic Chemical Manufacturing	● 0.65	60	(22)	-27.3%	8.0%	10.5%	\$77,376	80.2%
Total, Target Sector		● 1.05	7,149	(571)	-7.4%	-1.6%	4.9%		
Total, All Jobs			390,174	6,223	1.6%	2.7%	7.6%	\$42,394	81.1%

Source: Economic Modeling Specialists International (EMSI)

Note: Earnings ratio refers to the ratio of local earnings (wages plus supplements) to the national average for that same sector. This helps provide an important perspective on the relative cost of labor in a community. Location quotients (LQs) measure the relative concentration of regional employment in a given business sector. Specifically, they are calculated by dividing a sector's share of regional employment by that sector's share of national employment. A location quotient above 1.0 would indicate that the sector is more heavily concentrated in the region than it is nationally. Color-coding: Employment growth is color-coded such that growing sectors are presented in green text and declining sectors in red text. Those with location quotients greater than or equal to 1.1 are presented with a green dot. LQs lower than 0.9 are presented with a red dog and LQs between 0.9 and 1.1 with a yellow dot.

REGIONAL OVERVIEW: The greater Wichita region and the state as a whole have a long history with Agriculture as a main economic driver. In 2017, agriculture, food, and food processing sectors had a direct output of \$1.97 billion and supported 6,167 jobs in Sedgwick County alone. Cowley County's agriculture sector had an additional direct output of roughly \$1.6 billion and supported another 2,398 jobs, while Harvey County's agriculture sectors contribute \$1.37 in direct output and supports 3,065 jobs. In Cowley County, the total value of its agriculture, food, and food processing sector is as much as 36 percent of its gross regional

product (GRP).^{xvii} **Agriculture is thus the economic lifeblood of many greater Wichita counties and one of the region's most critical wealth-generating export sectors.**

Overall, there are over 7,000 jobs in the Agriculture target. While employment has declined over the past five years, it should be noted that jobs in the preceding table only include establishments directly involved in agriculture production and processing. As such, an establishment such as Cargill's regional headquarters is not included in the total, though the proximity to its processing plant and innovation center, as well as the region's agriculture base, was likely one of the factors that influenced its decision to locate/remain in the region. Its presence is one example of how the region's Agriculture sector has a large impact on other sectors in the economy such as regional headquarters (management of companies).

KEY LOCAL EMPLOYERS: Cargill Protein Group, Farmland Foods, Koch Industries, Dold Foods, ICM, Hiland Dairy Foods, Grain Craft, POET Ethanol Products, Tyson Foods, Ardent Mills

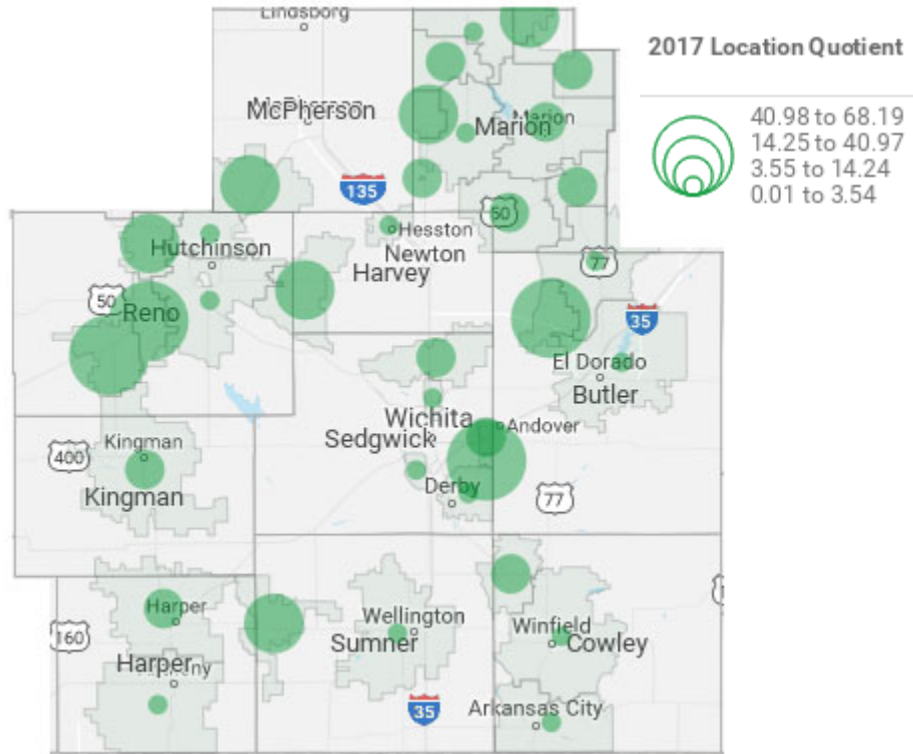
NATIONAL TRENDS AND MARKET OUTLOOK: As new technology develops and equipment to improve efficiencies advances, it will be important that Agriculture is positioned to be competitive in the future by ensuring farmers have the education, training, and resources to stay up-to-date and have access to the capital they need to invest in new equipment.

Global population growth is expected to put pressure on the world's food production system. The United Nations projects that the global population will expand from 7.6 billion in 2015 to 9.8 billion by 2050.^{xviii} In order to meet agricultural demand, the Food and Agricultural Organization of the United Nations estimates that global food production must increase by 70 percent by 2050.^{xix} The disproportionate rise of the middle class globally will increase demand for high value protein and value-added products. As a result, companies and countries must continually identify methods to secure food resources, improve production efficiency, and protect the food system from contamination and bioterrorism. Food innovation technologies range from new practices like hydroponic vertical urban farms to technology-enabled agricultural machinery that utilizes GPS and data analytics to further enhance farm yields.

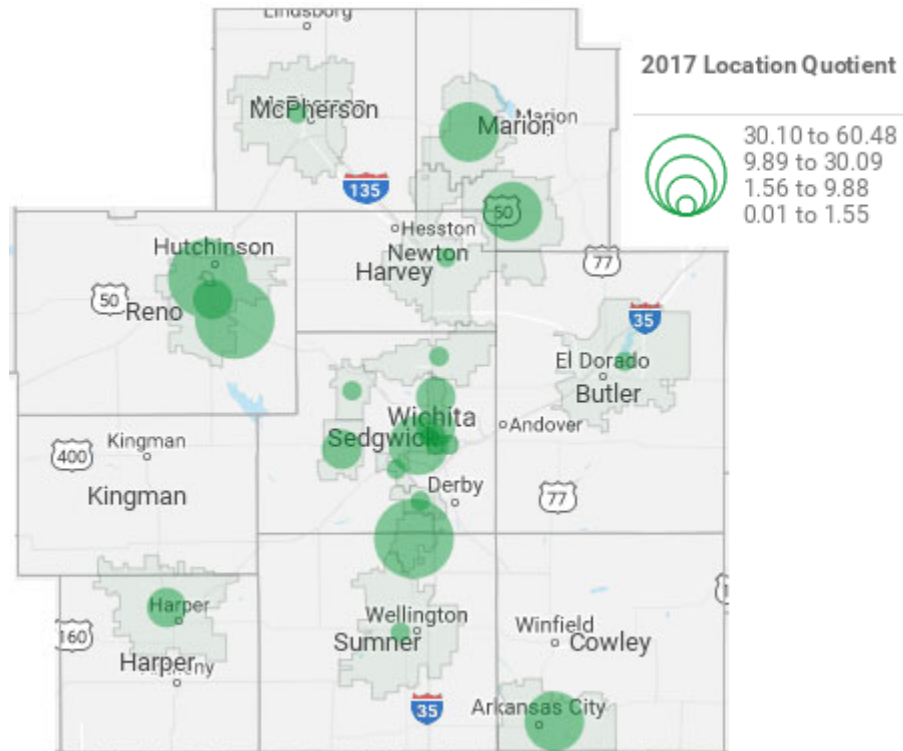
In the United States, employment in Agriculture is projected to increase by nearly 85,000 jobs and grow by three percent between 2017 and 2022. Employment in processing-related agriculture activities is projected to grow by 5.1, while jobs in farming-related agriculture sectors are expected to grow by 1.9 percent. This is likely influenced by advancements in technology as automation and new and emerging technologies increase efficiencies thereby decreasing the amount of labor necessary. Employment in ethyl alcohol manufacturing is projected to grow the fastest at 11.3 percent over the next five years. Other food manufacturing is also projected to grow rapidly, increasing by 11 percent between 2017 and 2022.

GEOGRAPHIC DISTRIBUTION: Of all the Regional Growth Plan targets, Agriculture is one of the most prominent with stronger employment concentrations in the rural counties. This is especially true for Crop and Animal Farming, where Reno and Marion Counties feature the greatest intensity of employment. However, all greater Wichita counties possess at least some concentration of Agriculture employment.

FIGURE 41: GEOGRAPHIC CONCENTRATIONS OF CROP AND ANIMAL FARMING NICHE



Source: Economic Modeling Specialists International (EMSI)

FIGURE 42: GEOGRAPHIC CONCENTRATIONS OF VALUE-ADDED PRODUCTS NICHE


Source: Economic Modeling Specialists International (EMSI)

KEY FINDINGS AND STRATEGIC CONSIDERATIONS

- ✓ **Agriculture is a major source for new wealth in the region.** Agriculture accounts for 45 percent of the state's economy while the 65 agriculture and food sectors combine to provide nearly \$68 billion in total economic contribution to the state.^x In the greater Wichita region, exports from the Agriculture target were estimated to be \$3.4 billion in 2017.

FIGURE 43: AGRICULTURE SECTOR EXPORTS, 2017

NAICS	Industry	Exports
3116	Animal Slaughtering and Processing	\$1,288,253,888
1120	Animal Production	\$700,351,626
1110	Crop Production	\$457,221,562
3112	Grain and Oilseed Milling	\$301,042,190
3115	Dairy Product Manufacturing	\$237,708,586
3119	Other Food Manufacturing	\$218,594,981
325199	All Other Basic Organic Chemical Manufacturing	\$105,557,603
3274	Lime and Gypsum Product Manufacturing	\$24,930,006
1151	Support Activities for Crop Production	\$16,571,684
1152	Support Activities for Animal Production	\$1,782,339
325193	Ethyl Alcohol Manufacturing	\$1,753,057
Total Agriculture Exports		\$3,352,014,465

Source: Economic Modeling Specialist International (EMSI)

Note: The export figures show the amount of money that is spent by industries located outside the region in exchange for goods or services produced by each industry located in the region. Exports include both foreign and domestic.

- ✓ Many of the jobs in the agriculture sector have low educational requirements with some short-term on-the-job training. This includes jobs such as farm workers and laborers, slaughterers and meat packers, packaging and filling machine operators and tenders, and hand packers and packagers. Despite lower educational requirements, there are several quality employment opportunities within the agriculture target, especially in the processing niche. Industrial machinery mechanics have average wage of \$27.17 an hour; employment growth has been strong recently as jobs increased by 14.1 percent. Likewise, first-line supervisors of production and operating workers earned an average annual wage of \$29.67 while inspectors, testers, sorters, samplers, and weighers earned \$24.81 an hour on average in 2017.
- ✓ In 2015, the state produced 550.5 million gallons of ethanol worth an estimated \$886.3 million. Almost all of the United States' production of ethanol uses corn as a feedstock. According to the U.S. Energy Information Administration (EIA), ethanol production margins at U.S. corn ethanol plants averaged and estimated 22 cents per gallon in 2017. The USDA recently released its ten-year forecasts through 2027. Regarding the U.S. biofuel sector, the report states, "Ethanol production is projected to increase in the beginning of the projection period, afterwards declining through the rest of the decade. Even with the U.S. ethanol production decline, demand for corn to produce ethanol continues to have a strong presence in the sector, accounting for over 35 percent of total U.S. corn use throughout the projection period."^{xxi}
 - ICM, a global leading biofuels process technology provider, and The Andersons Inc., a publicly-traded company with diverse interests encompassing a variety of agribusinesses,

recently announced plans to develop a 70 MMgy biorefinery to be located in Colwich, Kansas. Plans are to build and operate the most advanced ethanol plant in the world to be the highest yielding, most profitable, and lowest carbon ethanol gallon in the United States ethanol industry. The plant is still under construction, but the first phase of start-up is scheduled for spring 2019 with the plant fully operational by the end of 2019.

- ✓ Recent successes are a testament to the region's strength in Agriculture and the indirect effect that the Agriculture sector has on the region. Cargill's recent investment in its \$60 million headquarters facility in downtown illustrates that the company recognizes the assets in the greater Wichita region and stated that the city was ideal for the location of its headquarters to guide the company's protein business growth. Additionally, the \$15 million, \$75,000 square-foot Cargill Innovation Center houses research, development, culinary, laboratory, pilot plant and distribution capabilities.
- ✓ Broadband is reportedly a major challenge in the rural communities and is an issue for the Agriculture sector. Rural broadband and mobile networks that provide faster download and upload speeds are needed in order for business to be able to utilize the technological advancements that improve the efficiencies within the industry.
- ✓ Feedback from input participants reported that there is still a perceived bias against agriculture work and the Agriculture sector, in general. A lack of knowledge surrounding the regional impact that the sector has indirectly on others makes it difficult to get support for growing and strengthening the sector and attracting younger workers to consider a career in Agriculture. Stakeholders from the Agriculture sector reported that more should be done to educate residents on the importance of agriculture to the economy and the diversity of career opportunities available within the sector.
- ✓ Agriculture aligns with the state's economic activities with many available resources that can be leveraged locally to help support and foster growth within the industry. Kansas tax law allows sales tax exemption for farm machinery and equipment and various ag-based inputs. Recognizing that the success of the Kansas economy is largely influenced by the success of the agriculture industry, the Kansas Agricultural Growth Strategy was developed over the past two years.^{xxii} After hundreds of meetings between agriculture industry leaders statewide to discuss the opportunities in and the barriers to economic growth, the Growth Strategy was developed with desired outcomes for each sector and specific action items to achieve those outcomes.
- ✓ There are new and expanding opportunities to leverage the agriculture sector. For example, Kansas is one of the fastest-growing dairy states in the nation with infrastructure to support continued growth. Nearby in Southwest Kansas, there are three processing plants working with evaporated or dry milk in order to capture and reuse water. DFA Garden City, a new, state-of-the-art dairy ingredients plant located in Southwest Kansas recently opened. The new facility is a partnership between Dairy Farmers of America (DFA) and 12 of its member farms in Southwest Kansas. It will help to support dairy growth in the region and meeting rising demand for U.S. dairy domestically and globally.

- ✓ Leveraging the greater Wichita region's strengths in business and market analysis, some local officials feel the region could make strong inroads into value-added agricultural products. An example cited was the "Vidalia" onion cultivated in Georgia. The differentiated production and marketing of this product could be replicated in the greater Wichita region, per these stakeholders.
- ✓ New technologies are also being used to improve agricultural operations. Drone technology is advancing innovations such as precision agriculture to allow farmers to manage crops and ensure efficiency of inputs like water and fertilizer while maximizing productivity, quality, and yield. Drones also enable farmers to monitor crop and livestock conditions in real-time and identify problems that cannot be seen from the ground-level. Automation and GPS guidance allows the drone to map and survey the ground and takes pictures using onboard sensors and a built-in camera.
 - In 2015, the FAA approved the first drone weighing more than 55 pounds to carry tanks of fertilizers and pesticides. These drones are capable of spraying crops with greater precision and increased efficiency. In 2016, fixed-wing agricultural drones accounted for 70 percent of market share. Global Market Insights forecasts the agriculture drone market to surpass \$1 billion by 2024, with global shipments exceeding 200 thousand units. Growing awareness of UAV benefits and increasing technological advancements to enhance quality farming techniques will drive growth in the industry.
 - Fort Hays State University recently partnered with Hutchinson Community College through a USDA grant to create a post-secondary degree program focused on drones in agriculture. The program is aimed at enhancing the technical and analytical skills of students and producers using advanced precision agriculture technologies.

Healthcare

DEFINITION: Healthcare is a mature sector in the greater Wichita region with business activities spread throughout the region. This sector is primarily made up of establishments involved in healthcare services and delivery. It includes establishments engaged in the practice of general or specialized medicine, providing diagnostic and medical treatment (both surgical and nonsurgical) to inpatients with a wide variety of medical conditions, and outpatient services, among others. Additionally, skilled nursing facilities, residential facilities, and continuing care retirement communities are included in this sector.

Growth opportunities are primarily focused on supporting the expansion of existing employers. Attracting healthcare services firms to the greater Wichita region is not a viable strategy due to the competitive realities of this sector and the largely local-serving nature of the region's healthcare economy. So-called "traded," export-driven healthcare services sectors can be found in national and global medical hubs such as Rochester, Minnesota – home of the Mayo Clinic – the Texas Medical Center in Houston, the Johns Hopkins complex in Baltimore, and other major healthcare destinations that attract well-heeled patients from around the world.

With that said, given that the healthcare sector is a major source for regional employment and wealth, its continued success is a crucial component to the region's overall future prosperity. In addition to ensuring that the healthcare community has the business climate and workforce that it needs to be successful, there are also opportunities to foster collaborations between researchers at Wichita State and the local healthcare service providers. Additionally, there are opportunities in the existing regional healthcare industry to foster job creation in areas that leverage technology such as with telemedicine, big data analytics, and blockchain, among others technological applications that are rapidly growing in use in the healthcare field.

FIGURE 46: GREATER WICHITA HEALTHCARE SECTOR ACTIVITY, 2012-2017

NAICS Subsector	2017		5-yr Chg. (2012-17)				Earnings	
	LQ	Jobs	#	%	KS %	US %	2017	% of US
6211 Offices of Physicians	1.05	6,673	(730)	-9.9%	-14.3%	6.1%	\$85,960	96.2%
6212 Offices of Dentists	0.98	2,331	112	5.1%	2.7%	8.0%	\$52,617	97.6%
6213 Offices of Other Health Practitioners	0.83	2,041	85	4.4%	6.6%	18.7%	\$41,721	97.3%
6214 Outpatient Care Centers	0.97	2,168	660	43.8%	16.3%	34.7%	\$47,701	75.3%
6215 Medical and Diagnostic Laboratories	0.70	483	20	4.2%	10.0%	11.4%	\$51,969	83.0%
6216 Home Health Care Services	0.67	2,368	(807)	-25.4%	-29.3%	15.4%	\$34,500	115.7%
6219 Other Ambulatory Health Care Services	0.68	549	8	1.4%	0.1%	8.8%	\$42,737	92.7%
6221 General Medical and Surgical Hospitals	0.84	9,583	(1,352)	-12.4%	6.5%	5.3%	\$49,304	78.1%
6222 Psychiatric and Substance Abuse Hospitals	3.33	949	591	164.9%	94.1%	13.5%	\$35,538	76.3%
6223 Specialty (except Psychiatric and Substance Abuse) Hospitals	1.02	568	210	58.9%	42.9%	2.9%	\$47,140	77.8%
6231 Nursing Care Facilities (Skilled Nursing Facilities)	1.35	5,408	(231)	-4.1%	-11.3%	-1.6%	\$26,514	79.5%
6232 Res. Intell. & Dev Disabil./Mental Health/Substance Abuse Facilities	0.59	914	140	18.1%	9.0%	8.0%	\$27,130	90.4%
6233 CC Retirement Communities/Assisted Living Facilities for the Elderly	2.20	4,902	370	8.2%	13.8%	14.6%	\$27,211	99.2%
Total, Target Sector	1.01	38,937	(925)	-2.3%	-0.4%	8.7%		
Total, All Jobs		390,174	6,223	1.6%	2.7%	7.6%	\$42,394	81.1%

Source: Economic Modeling Specialists International (EMSI)

Note: Earnings ratio refers to the ratio of local earnings (wages plus supplements) to the national average for that same sector. This helps provide an important perspective on the relative cost of labor in a community. Location quotients (LQs) measure the relative concentration of regional employment in a given business sector. Specifically, they are calculated by dividing a sector's share of regional employment by that sector's share of national employment. A location quotient above 1.0 would indicate that the sector is more heavily concentrated in the region than it is nationally. Color-coding: Employment growth is color-coded such that growing sectors are presented in green text and declining sectors in red text. Those with location quotients greater than or equal to 1.1 are presented with a green dot. LQs lower than 0.9 are presented with a red dot and LQs between 0.9 and 1.1 with a yellow dot.

KEY LOCAL EMPLOYERS: Via Christi Health, Wesley Medical Center, Wichita Clinic PA, Robert J. Dole VA Medical Center, Children's Mercy Wichita, University of Kansas, Susan B Allen Memorial Hospital, South Central Kansas Medical Center, William Newton Memorial Hospital, Harper Hospital, Newton Medical Center, Hilltop Manor Inc., Marion County Home Care, McPherson Medical and Surgical Associations, Hutchinson Regional Healthcare System, Prairie View and Sumner Regional Medical Center, among others.

REGIONAL OVERVIEW: Over the past five years, the greater Wichita region's employment in Healthcare has been declining. The region lost 925 jobs in healthcare and employment fell by 2.3 percent between 2012 and 2017. These trends are in sharp contrast to most U.S. regions, where healthcare was often the only private sector that grew during the Great Recession and its aftermath.

In the greater Wichita region, employment is largely composed of health services, which tends to grow primarily based on population increases. As discussed previously, the Wichita MSA experienced domestic outmigration between 2010 and 2017. During that time period, there was a net loss of 18,452 residents from the metro area. Natural increase (more births than deaths) and a small amount of international in-migration helped to soften the losses experienced through domestic outmigration. Overall, the population in the ten-country greater Wichita region grew by just 0.8 percent between 2012 and 2017.

Even though the healthcare sector is primarily locally serving, nearly one in ten regional jobs is found in healthcare, making it an importation component of the region's economy. Tactics for strengthening and sustaining the healthcare sector over the next five years will be focused on business retention and expansion opportunities.

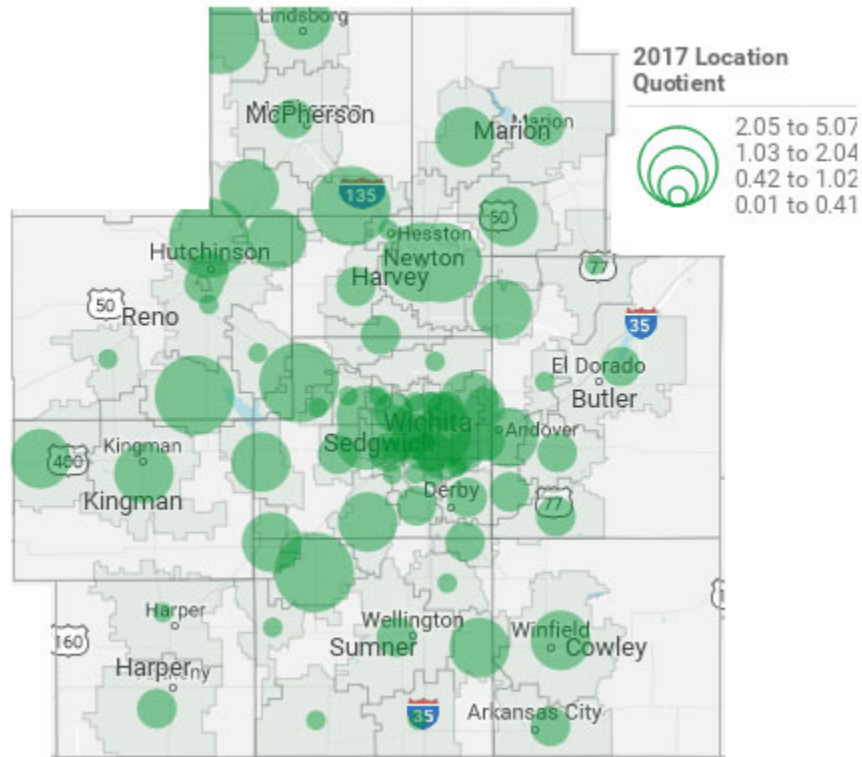
NATIONAL TRENDS AND MARKET OUTLOOK: Nationally, healthcare jobs have been growing rapidly. Over the past five years, employment in healthcare grew by 8.7 percent, faster than the overall economy. The Bureau of Labor Statistics projects that employment of healthcare occupations will grow by 18 percent between 2016 and 2026 and that it will create about 2.4 million new jobs across the U.S.

Increased demand tied to an aging population will be a main driver of growth for healthcare services. The U.S. Census Bureau projects that by 2030, all baby boomers will be older than age 65 and that by 2035, older adults will outnumber children for the first time in U.S. history. While greater demand for healthcare services will help to drive job creation in the health care sector, there will also be additional demand for skilled workers to fill jobs vacated by the baby boomer generation retiring in the coming years. Overall, there will be an estimated 5 million job openings from workers retiring or otherwise permanently leaving a healthcare-related occupation over the next ten years.

GEOGRAPHIC DISTRIBUTION: Healthcare can be found in every greater Wichita region county, with its presence spread to varying degrees throughout the region. Given that the healthcare sector is focused on

services and the delivery of care, it is concentrated accordingly based on where the population centers are located in the greater Wichita region.

FIGURE 47: GEOGRAPHIC CONCENTRATIONS OF HEALTHCARE



Source: Economic Modeling Specialists International (EMSI)

KEY FINDINGS AND STRATEGIC CONSIDERATIONS

- ✓ The healthcare sector in the greater Wichita region is an important source of jobs and wealth for residents. In total, **roughly one out of every ten jobs are in the healthcare sector**. Given the thousands of jobs tied to healthcare, it is critical to ensure that the sector maintains its vitality through existing business services. Total payroll for the healthcare sector is roughly \$2.4 billion, while its gross regional product (GRP) was more than \$2.6 billion in 2017.
 - The healthcare sector has a large economic impact on the region. According to a recent study by CEDBR on the *Economic Impact of a Physician in Kansas* found that the total wages earned and the subsequent spending of those earnings in the economy by one physician and four support staff ultimately created seven additional jobs.^{xxiii}
 - In addition to supporting other locally-serving jobs such as those in retail and food service, the industry also has an economic impact on employment in related medical business sectors such as pharmaceutical and medicine manufacturing, medical equipment and supply

manufacturing, medical insurance sales and grant making and giving services. According to a recent economic impact study that was conducted on the healthcare sector in the Wichita metro area, that are roughly 73,000 jobs directly or indirectly tied to the healthcare sector.^{xxiv}

- In 2016, health care generated approximately \$186.5 million in state income and state and local sales taxes, according to the same economic impact study. This figure does not include the real estate taxes paid by health care companies and employees which is an important source of revenue and helps to support local schools and government services.
- ✓ Unlike some sectors, healthcare does more than provide employment opportunities for residents and economic activity for the region. **It also plays an important role in a community's quality of life.** Access to quality, affordable healthcare is important to individuals at every age. Greater Wichita is home to numerous specialty healthcare providers, including a strong pediatrics specialty as reported by stakeholders, which is important to individuals looking for a community to raise a family. The greater Wichita region also has an above average concentration of jobs at nursing care facilities (LQ=1.35) and continuing care retirement communities (2.20).
- ✓ Access to healthcare in the rural areas is more challenging, and is a problem experienced nationally. Employment in the healthcare sector in Harper County is 70 percent less concentrated than the average American community, while Sumner County is 34 percent less concentrated. The remaining counties in the greater Wichita region have average or slightly above average concentrations of employment in healthcare. The overall concentration of healthcare sector employment is average (1.0), though stakeholders from the healthcare community reported that Wichita does have a regional draw for referrals from outside of the metropolitan boundaries.
- ✓ In addition to drawing patients through referrals from outside the region, **there is the opportunity to access a wider range of customers through telemedicine.** Telemedicine allows board-certified physicians to interact with patients in remote locations using videoconferencing equipment and shared electronic medical records systems thereby reducing the need for physicians to travel to remote areas and enabling individuals without transportation to have access to health care. Additionally, telemedicine enables physicians the opportunity to see a larger number of patients, more often.
 - Kansas lawmakers passed a bill in May 2018 that expands health coverage through telemedicine. According to stakeholders from the healthcare community, the greater Wichita region is “behind the curve” when it comes to telemedicine, but there is the opportunity to expand its footprint, with the region “poised to provide tertiary care to the rural communities.”
 - This is bolstered by recent successes such as Free State Healthcare. Free State Healthcare is a multi-specialty practice that use technology to connect with patients in rural areas. In 2017, it received grant funding through JumpStart Kansas Entrepreneurs, a program created to grow Kansas-Based businesses.

- ✓ The Healthcare sector provided quality employment opportunities for residents. Average wages in the greater Wichita region in the healthcare was \$57,833 in 2017, roughly \$15,000 higher than the regional average. Additionally, healthcare has a well-established career ladder than individuals can work their way up through additional training.
- ✓ The region has capacity to grow its own healthcare workers locally at the area's higher education institutions. Wichita State's College of Health Professions offers a wide variety of degree programs from certificate to doctoral degrees at its three healthcare schools – the school of oral health (dentistry and dental hygiene), school of nursing, and school of health sciences. The University of Kansas School of Medicine – Wichita has over 200 enrolled students with 75 full-time faculty and 74 part-time. Butler Community College, Cowley College, and Hutchinson Community College also have nursing programs. Over the past ten years, there were more than 6,000-degree completions in registered nursing-related program in the greater Wichita region.
 - However, input participants reported that the region is lacking the appropriate tech talent that is increasingly becoming necessary in the healthcare sector. Data analytics, data scientists, and machine learning are growing critical components to healthcare companies. Stakeholders from the healthcare community in the greater Wichita region report that they are having to use out-of-state providers because they are unable to find the IT talent or tech companies locally to meet their needs.
- ✓ The Center for Research for Infant Birth and Survival (CRIBS) at the University of Kansas School of Medicine – Wichita campus was recently established. The center focuses on research and understanding infant mortality and survival with the goal of eradicating preventable infant death in Kansas. The center provides program evaluation, research, dissemination and implementation of evidence-based practices related to maternal and infant health and will develop an implementation network to share programs and best practices throughout the state. CRIBS hosted its inaugural Infant Mortality Research Symposium in April 2018.
- ✓ There are **potential opportunities to leverage the region's advanced manufacturing and materials sector and its engineering talent to expand the healthcare sector** in the greater Wichita region and create new export-oriented healthcare-related jobs. For example, many stakeholders cited the National Center of Innovation for Biomaterials in Orthopedic Research (CIBOR) at Wichita State University's National Institute for Aviation Research (NIAR) as an opportunity to stimulate economic growth in the region. The center is dedicated to researching and developing the potential of composite materials for use in a wide variety of bioscience and medical applications including the manufacturing of orthopedic implants. The region's strength in composite materials used by local aerospace companies could also be allied to a wide variety of medical applications.
- ✓ In 2016, CEDBR released population projections for each of the counties in Kansas. The projections estimate population growth by age cohort between 2014 and 2064. In Sedgwick County, the region's most populated county, the population over the age of 65 is projected to grow by 48.5 percent between 2014 and 2024. Likewise, Butler County is projected to see its population over the age of 65

grow by 39 percent. These **trends will create greater demand for elderly-care services** while putting additional strain on the tight labor market and working-age population to meet that demand.

Information Technology Systems and Support

DEFINITION: This sector is made up of companies that leverage technology to provide data services and customer support. The sector includes two niches: 1) Digital Network Services and Cybersecurity, and 2) Business Process Outsourcing. The **Digital Network Services and Cybersecurity** segment primarily includes companies that provide data and network management, administration, and protection services. These firms are often consultancies that offer suites of support services as turnkey solutions for clients' information technology needs.

As information and communications technologies (ICT) converge in their relevance to business processes and innovation, so-called "platform" applications such as Big Data/data analytics, software-as-a-service (SaaS), cybersecurity, blockchain, cloud computing, artificial intelligence, machine learning, geomatics, and Internet of Things (IoT), are being leveraged individually and in combination to address business challenges and opportunities. Regions that are able to 1) develop capacity to innovate in these technologies, 2) adapt ICT platforms to optimize existing business operations, and 3) attract firms, entrepreneurs, and capital to create new ICT business opportunities – leveraging local firms as a customer base – will grow into knowledge hubs able to attract and retain top technology talent. **Cybersecurity is called out as a particular ICT opportunity in the greater Wichita region because of efforts already underway to specialize in these applications.**

Business Process Outsourcing companies include establishments that facilitate key administrative and "back office" functions for companies engaged in some other primary line of business. For instance, retailers are in the business of selling products to consumers, but many consolidate their phone-based support into customer care centers. Other common activities that are consolidated into a single location such as accounting, payroll services, and data centers are often referred to as shared services. As recent studies on "missing middle"^{xxv} occupations have shown, entry-level customer and operational support positions serve as an important bridge for workers seeking higher skill, higher paying ICT careers. This is especially important in the greater Wichita region, which does not have a deep "bench" of technology-savvy talent and will need to slowly build its capacity and pipeline of technology workers.

As the following table shows, the greater Wichita region has far more existing capacity in Business Process Outsourcing than the higher-skill segment of Digital Network Services and Cybersecurity. However, the IT Systems and Support sector overall has been growing in recent years, demonstrating that there is an untapped market for these services in the greater Wichita region that has likely been imported from outside the region.

FIGURE 48: GREATER WICHITA IT SYSTEMS & SUPPORT SECTOR ACTIVITY, 2012-2017

NAICS	Subsector	2017		5-yr Chg. (2012-17)				Earnings	
		LQ	Jobs	#	%	KS %	US %	2017	% of US
	Digital Network Services and Cybersecurity	0.40	2,409	967	67.0%	57.5%	22.4%		
518210	Data Processing, Hosting, and Related Services	0.60	457	56	13.8%	11.4%	21.7%	\$56,063	51.2%
541511	Custom Computer Programming Services	0.34	778	301	62.9%	63.6%	22.3%	\$65,048	59.2%
541512	Computer Systems Design Services	0.43	1,069	624	140.2%	43.1%	25.1%	\$85,422	81.1%
541513	Computer Facilities Management Services	0.34	61	6	10.9%	569.1%	26.0%	\$45,266	49.5%
541519	Other Computer Related Services	0.14	43	(20)	-31.2%	-18.0%	3.8%	\$48,323	45.8%
	Business Process Outsourcing	1.72	8,559	585	7.3%	-10.2%	9.9%		
541214	Payroll Services	1.00	417	207	98.4%	-29.2%	0.7%	\$39,916	50.0%
541219	Other Accounting Services	1.41	1,272	310	32.2%	-0.4%	7.9%	\$41,966	83.0%
5611	Office Administrative Services	2.83	3,594	(230)	-6.0%	-16.9%	16.8%	\$81,465	98.8%
5614	Business Support Services	1.37	3,276	298	10.0%	-4.3%	9.0%	\$29,894	73.7%
	Total, Target Sector	1.00	10,968	1,552	16.5%	10.7%	16.4%		
	Total, All Jobs		390,174	6,223	1.6%	2.7%	7.6%	\$42,394	81.1%

Source: Economic Modeling Specialists International (EMSI)

Note: Earnings ratio refers to the ratio of local earnings (wages plus supplements) to the national average for that same sector. This helps provide an important perspective on the relative cost of labor in a community. Location quotients (LQs) measure the relative concentration of regional employment in a given business sector. Specifically, they are calculated by dividing a sector's share of regional employment by that sector's share of national employment. A location quotient above 1.0 would indicate that the sector is more heavily concentrated in the region than it is nationally. Color-coding: Employment growth is color-coded such that growing sectors are presented in green text and declining sectors in red text. Those with location quotients greater than or equal to 1.1 are presented with a green dot. LQs lower than 0.9 are presented with a red dog and LQs between 0.9 and 1.1 with a yellow dot.

KEY LOCAL EMPLOYERS: Baseline Creative, Callcap, Concergent IT, DCI, Faneuil, High Touch Technologies, ISG Technology, KeyCentrix, Koch Business Solutions, NetApp, Strategic Data Storage, Inc., Data Center Inc., CCH, American Control & Engineering (ACES), and Ulterius Technologies, among others.

REGIONAL OVERVIEW: Over the past five years, the greater Wichita region has added more than 1,500 jobs within this sector; employment growth has kept pace with the national average. With the region's high concentration of jobs in extremely cyclical industries, Information Technology Systems and Support is an attractive opportunity to diversify the economy and increase the region's flexibility during downturns. Nationally, the economy contracted by 2.6 percent between 2007 and 2012; however, employment in Information Technology Systems and Support sectors grew by eight percent during that time. In addition to increasing the region's economic diversity, this sector also provides quality employment opportunities for residents at varying levels of education, capitalizes on the region's large student population and recent graduates, and leverages the region's other target sectors.

Although the Digital Network Services and Cybersecurity niche is currently less concentrated than the national average, it has grown rapidly over the past five years. The computer systems design services subsector added over 600 jobs alone between 2012 and 2017. Establishments in this subsector are primarily engaged in planning and designing computer systems that integrate computer hardware, software, and communication technologies. Jobs within this niche are high paying, with average wages for all five subsectors above the regional average.

The Business Process Outsourcing niche are lower paying jobs but provide quality employment opportunities and experience for entry-level workers. Regional employment in this niche grew by 7.3 percent over the past five years. This does not include plans announced by Faneuil in 2017 to bring as many as 500 new jobs to Wichita in 2018. Faneuil provides business process outsourcing services, such as customer care, tech assistance, and back office operations, to a number of sectors including healthcare, social programs, and transportation. Companies that provide Business Process Outsourcing services could focus on higher-end sector businesses where technology-intensive firms could also serve to bolster the region's IT economy and workforce.

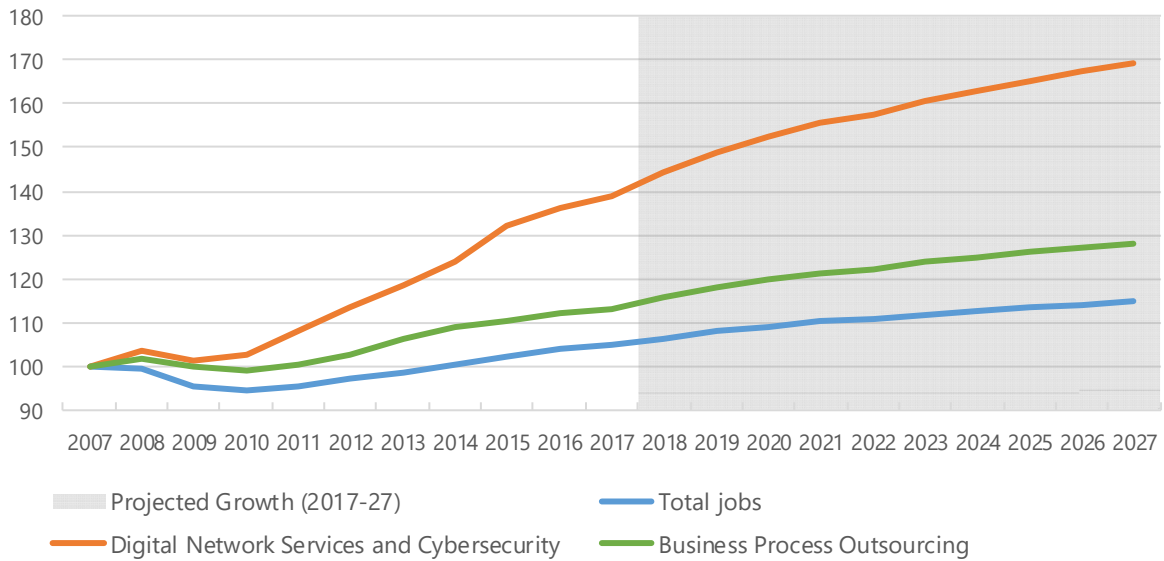
NATIONAL TRENDS AND MARKET OUTLOOK: Employment within the Information Technology Systems and Support sector has been growing rapidly in recent years at a rate of more than double the pace of total job growth over the past five years. Employment within the Digital Network Services and Cybersecurity niche increased by an impressive 22.4 percent while the Business Process Outsourcing sector grew by 9.9 percent. Advancements in technology have been a driving force for economic growth in recent years, especially within the Digital Network Services and Cybersecurity sector as demand for their services increases. Technological advancements have enabled companies to more efficiently and effectively reach clients and customers across the country and globally and have opened up new growth opportunities for Business-to-Business (B2B) companies and data processing firms. With digital information growing at an exponential rate, there is ever-increasing demand for innovations and new capacity with respect to data analytics, management, and storage.

The Internet of Things (IoT) is transforming business activities within multiple sectors and its growth prospects are immense; data is gathered and used for increased machine-to-machine communication, cloud computing software, and smart technologies. Its applications are vast and include items such as sensors which are used to measure, evaluate, and gather data. Manufacturing, transportation, logistics, and utilities are projected to lead IoT spending but there are a number of consumer applications as well. IoT has the potential to improve the accuracy, speed, and scale of supply chains and open new opportunities for Business-to-Consumer (B2C) companies. Business-to-Business (B2B) opportunities will likely be driven by activities such as analytics, connectivity, cybersecurity, and cloud and platform services. According to one estimate, the IoT market is projected to grow from \$2.99 trillion in 2014 to \$8.9 trillion in 2020.^{xxvi}

The Business Process Outsourcing sector includes a wide range of functions that vary in complexity, unlike the traditional outbound call center operations that once dominated the market. Today's business activities range from low-skill data entry jobs all the way to professional services and support activities that include clinical health care and financial services. These more advanced operations require a higher skilled workforce with specialty degrees and licenses (depending on the specific company's services). Jobs within the business support services subsector are focused on higher customer services skills and aim to improve the customer experience, expectations, and service. Over the next two years, contact centers are projected to increase in both volume and complexity. Sectors such as life science and health care will need a higher skilled workforce capable of more complex interactions with customers. Deloitte's 2017 Global Contact Center Survey reported that all respondents have plans to invest in talent improvement programs over the next two years. Talent-related initiatives are indication of companies investing in equipping the right talent with the right skills for more complex tasks in contact centers. Likewise, interactions with customers are projected to become more

diverse through the use of online chats, social media, and text messaging, which also demand a higher skilled workforce.

FIGURE 49: UNITED STATES EMPLOYMENT INDEX 2007- 2017 (2007=100)

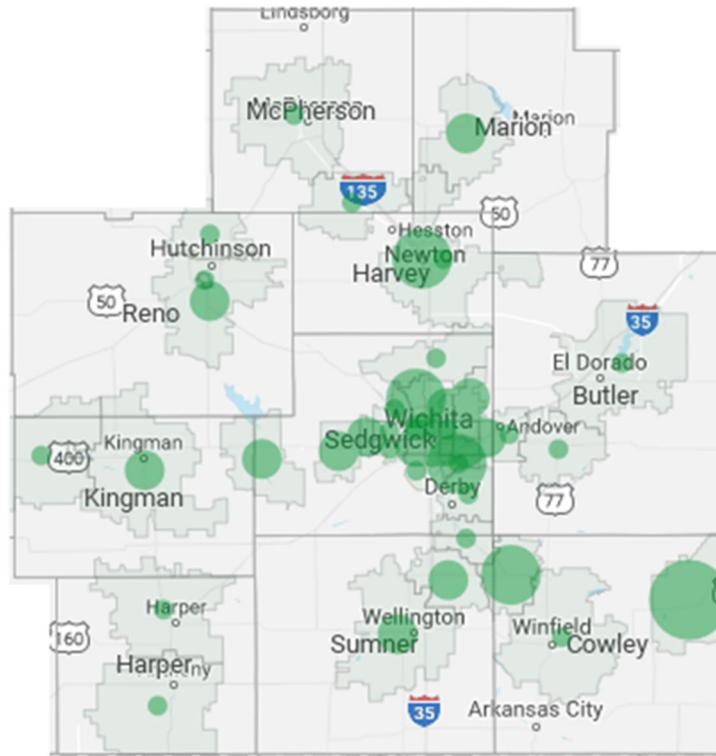


Source: Economic Modeling Specialists International (EMSI)

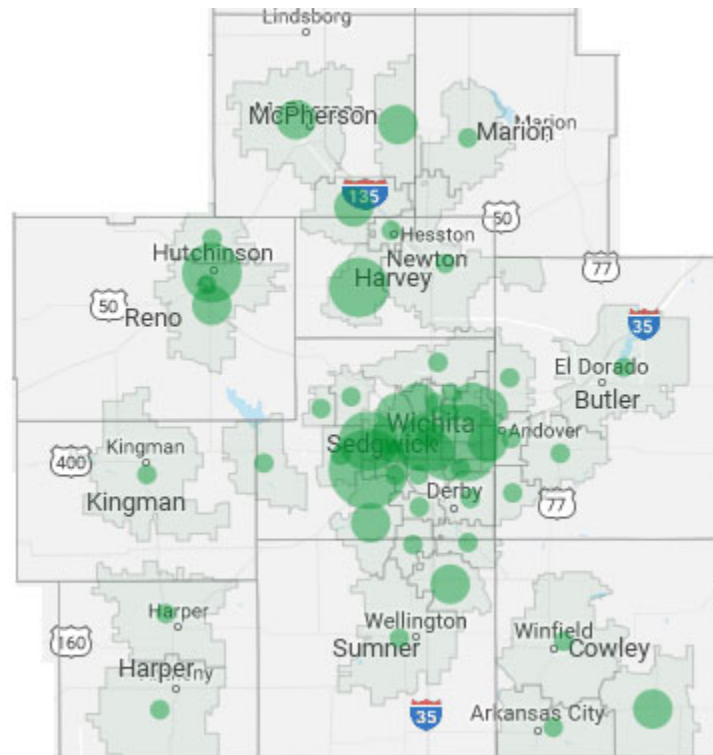
Growth prospects within this sector are extremely positive. Nationally, total employment is expected to increase by 9.5 percent between 2017 and 2027. In comparison, employment at Digital Network Services and Cybersecurity companies is projected to grow by 21.9 percent over the same time period. Likewise, jobs in the Business Process Outsourcing niche are projected to grow by 13.2 percent over the ten-year time period. Given the positive employment outlook and the immense technology applications to various sectors, the Information Technology Systems and Support looks to be a leader in job growth and economic activity.

GEOGRAPHIC DISTRIBUTION: The majority of employment in Information Technology Systems and Support establishments are concentrated in Wichita and Sedgwick County, which is partially influenced by the presence of McConnell AFB. Among the niches, there are other pockets of activity in Digital Network Services and Cybersecurity outside of Wichita that are found in Cowley County near Cambridge and Udall. Likewise, Business Process Outsourcing jobs are primarily located in Sedgwick County. Exceptions include concentrated employment in Harvey County near Halstead and in Reno County near Hutchinson.

FIGURE 50: GEOGRAPHIC CONCENTRATIONS OF DIGITAL NETWORK SERVICES AND CYBERSECURITY NICHE



Source: Economic Modeling Specialists International (EMSI)

FIGURE 51: GEOGRAPHIC CONCENTRATIONS OF BUSINESS PROCESS OUTSOURCING NICHE


Source: Economic Modeling Specialists International (EMSI)

KEY FINDINGS AND STRATEGIC CONSIDERATIONS

- ✓ Key site location consideration factors for data services and IT firms include a skilled workforce, the necessary infrastructure to support bandwidth capacity, and a good quality of life. The biggest challenges for growing the Information Technology Systems and Support sector in the greater Wichita region will therefore be its workforce and broadband capacity. The region's below-average concentration of workers in key occupations required for IT companies will make attracting companies to the region difficult. As can be seen in the following table of the **top 15 computer and IT-related occupations**, all but two – **Network & Computer Systems Administrators** and **Operations Research Analysts** – have below average concentrations in the greater Wichita region.

FIGURE 52: TOP 15 DATA AND IT-RELATED OCCUPATIONS

Description	2017		5-yr Chg. (2012-17)			Attributes	
	LQ	Jobs	SCK #	SCK %	US %	Avg. Hourly Earnings	Typical Entry Level Education
Computer User Support Specialists	0.89	1,512	133	9.6%	12.4%	\$18.25	Some college, no degree
Network & Computer Systems Administrators	1.07	1,016	57	6.0%	8.6%	\$30.77	Bachelor's degree
Software Developers, Applications	0.42	868	(29)	-3.2%	19.3%	\$42.53	Bachelor's degree
Computer Systems Analysts	0.49	719	(2)	-0.2%	15.4%	\$35.85	Bachelor's degree
Software Developers, Systems Software	0.56	588	(106)	-15.2%	12.6%	\$46.71	Bachelor's degree
Computer Occupations, All Other	0.74	521	12	2.4%	8.7%	\$31.94	Bachelor's degree
Operations Research Analysts	1.39	395	33	9.1%	20.5%	\$32.87	Bachelor's degree
Computer Programmers	0.51	363	8	2.4%	3.0%	\$32.40	Bachelor's degree
Web Developers	0.68	286	61	26.9%	20.8%	\$24.44	Associate's degree
Computer Network Support Specialists	0.42	215	(4)	-1.6%	8.4%	\$27.28	Associate's degree
Computer Network Architects	0.50	200	(16)	-7.4%	9.4%	\$42.49	Bachelor's degree
Database Administrators	0.68	199	8	3.9%	11.0%	\$37.83	Bachelor's degree
Information Security Analysts	0.37	90	(10)	-9.6%	13.5%	\$35.29	Bachelor's degree
Statisticians	0.80	72	12	19.3%	18.4%	\$37.45	Master's degree
Actuaries	0.87	48	5	10.8%	8.3%	\$53.61	Bachelor's degree

Source: Economic Modeling Specialists International (EMSI)

- ✓ Notably, there is momentum building behind improving the IT talent base in the greater Wichita region. A number of cybersecurity and computer degree programs have recently been launched in an effort to increase the region's tech talent and to attract and grow firms in related IT business activities. Until the Information Technology Systems and Support sector becomes more robust and prominent in the greater Wichita region, the region will need to focus its talent development on retaining recent graduates and creating jobs locally through BRE and entrepreneurship efforts.
 - Wichita State recently launched an engineering technology bachelor's degree with a concentration in cybersecurity and has plans to expand the program in the fall 2018. The university also offers a graduate certificate in information assurance and cybersecurity.
 - Butler Community College offers an associate degree in cybersecurity while Newman University has plans to launch a new business and strategic intelligence program.
 - In 2014, Wichita was chosen as one of 52 city finalists for the US2020 City Competition. US2020 is a national initiative to change the trajectory of science, technology, engineering and math (STEM) education in America by dramatically scaling the number of STEM professionals engaged in high-quality STEM mentoring with youth. The city competition challenged communities to develop plans to dramatically increase the scale and quality of mentorship between professionals working in STEM fields and students underrepresented in the sciences. In Wichita, STEMpact2020 is working with Wichita Public Schools, Girl Scouts, Big Brothers Big Sisters, and several other local youth-serving organizations to interest kids from underrepresented groups—girls, minorities, and low-income—in STEM careers.

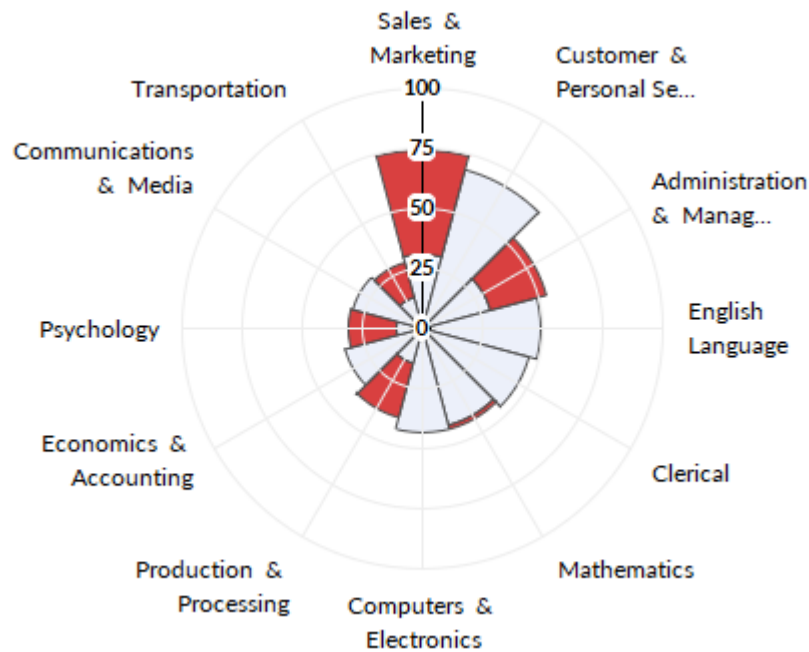
STEMpact2020 works with the region's tech companies to connect professionals with underrepresented youth by creating quality, high impact STEM mentoring relationship opportunities and getting students interested in STEM careers early on.

- ✓ New programming alone will not solve the local workforce challenge. Nationally, demand for IT talent such as data scientists has been skyrocketing. EMSI reported that job postings for data scientists grew by 600 percent between 2013 and 2017, with the top skills in high-demand including machine learning, statistics, and data analysis. Competition for talent with these skill sets will be fierce. As was highlighted by the 2016 Chung Report and in a follow-up presentation in 2018, one of the biggest issues inhibiting economic growth in the region is Wichita's human capital challenge. Wichita's workforce is shrinking, and graduates are leaving town. Since 2010, the Wichita MSA has had a net loss of more than 18,000 people. Overall, between 2011 and 2016, the labor force fell by 2.1 percent for a net loss of 8,380 available workers in the greater Wichita region. In addition to an outflow of residents, the Chung Report found that the greater Wichita region is not attracting recent graduates from the University of Kansas or Kansas State University.
- ✓ McConnell AFB is home to the 184th Intelligence Wing, a cyber-based military unit that handles network operations for the U.S. National Guard, detects and assesses cyber-intrusions on Department of Defense computer networks, and tests and employs cutting edge technology to protect Air Force entities from cyber-attacks. McConnell is one of only three Air Force cybersecurity centers.
 - At McConnell AFB, there are over 200 cyber professionals. As these cyber professionals retire from the military, the greater Wichita region has the opportunity to retain those talented and experienced IT workers in the private sector. A robust private cybersecurity niche will also aid McConnell in seeking potential partnerships for innovative research with military applications.
 - Because of the mission of the 184th Intelligence Wing, McConnell is linked to high-capacity communications fiber – a necessary component for IT companies. The potential exists for firms to access this capacity if security measures can be sufficiently met. The greater Wichita region's flat topography also makes it easier to get bandwidth in and out since it is a more cost-effective landscape to lay fiber.
- ✓ A team of Wichita area officials and industry leaders traveled to Arizona to explore the Arizona Cyber Threat Response Alliance (ACTRA) model for potential implementation in Greater Wichita. This potential center would serve as an information-sharing hub, entrepreneurial space, and potential attractor to outside firms. Discussions are still in the early stages and funding will be an issue to ensure the center is built to satisfactory capacity. ACTRA serves as the hub for collaborative cyber information sharing in a neutral environment where partners from industry, academia, law enforcement and intelligence come work together effectively.
- ✓ Ennovar Technology Solutions (ETS) is a non-profit organization affiliated with Wichita State University at the new Innovation Campus. ETS offers hardware testing, software development, technical support services, training services, and marketing services to support businesses and their

technology needs. Using student resources guided by university and industry experts. Ennovar provides real world technology experience to WSU students by partnering with businesses to research and develop technology. ETS employs up to 80 engineering, communication, graphic design, MBA, students and full-time professionals at any given time.

- ✓ Greater Wichita has selected resources for technology startups.
 - In 2015, several Wichita-based entrepreneurs and other community leaders launched the E2E Accelerator. The community-driven organization provides programming, mentoring, and seed capital funding through its E2E Fund. The not-for-profit organization has an accelerator program, as well as an incubator co-working space, and invests in growth-oriented companies with the overall mission to accelerate the Wichita area entrepreneurial ecosystem.
 - LaunchPrep, a partnership between the e2e Accelerator and Wichita State University's Center for Entrepreneurship, provides early-stage companies access to a select group of Wichita's most successful entrepreneurs. Their one-on-one mentorship enables ventures off the ground. Over the duration of the program LaunchPrep mentors examines all aspects of your venture, challenges the entrepreneur's strategy and inspires them to create an implementation plan to reach critical milestones. The end game is attainability of market validation, funding and accelerated growth.
 - GroundWork, a collaborative office space for early stage startup companies, opened in 2016. The 2,200-square foot space provides typical office amenities such as telephone, Wi-Fi, a receptionist, and a conference room, and it hosts informal programming on a variety of topics from law and hiring to intellectual property.
 - Startup Grind is a global startup community designed to educate, inspire, and connect entrepreneurs. The Wichita chapter features a new speaker each month.
- ✓ Companies that provide business support services often look to co-locate near a university which provides them with a steady supply of workers looking for flexible work schedules. In the Business Process Outsourcing niche, jobs are often lower skilled but provide good entry-level employment opportunities for residents. With over 15,000 students enrolled at Wichita State University, work experience in a Business Process Outsourcing company teaches employees valuable skills that can be used in a future career. Soft skills such as customer service, communication, and problem solving are valuable traits for today's labor market regardless of the sector. In the 2018 Regional Growth Plan Strategic Survey, 43.6 percent of respondents "disagreed" or "strongly disagreed" with the statement, "Workers possess adequate "soft" skills (punctuality, customer-service, proper attire, computer literacy, etc.)"

FIGURE 53: KNOWLEDGE GAP BETWEEN CUSTOMER SERVICE REPRESENTATIVES AND SALES REPRESENTATIVES, WHOLESALE AND MANUFACTURING, EXCEPT TECHNICAL AND SCIENTIFIC PRODUCTS



Source: Economic Modeling Specialists International (EMSI)

Note: The above chart compares the knowledge possessed by an average customer service representative and sales representatives, wholesale and manufacturing, except technical and scientific products based on national data. Gray displays the knowledge overlap and red represents the knowledge gap between the two occupations. In other words, the red bars represent the gap that a customer service representative would need to overcome in order to attain employment as a wholesale and manufacturing sales representative.

- ✓ Likewise, individuals that work in lower-skilled, entry-level jobs at companies that provide business support services can be upskilled through additional training and education. For example, there are nearly 2,000 Customer Service Representatives in the greater Wichita region; it is the most common occupation in the Business Process Outsourcing niche. As the previous graphic showed, the most important knowledge levels that a Customer Service Representative possesses can be analyzed to find compatible occupations where an individual could be quickly cross-trained into a higher skilled occupation in a growing sector that offers higher wages. In essence, an individual's time as a Customer Service Representative would be the first rung on their career ladder while they attain higher education at one of the region's higher education institutions or on-the-job training.
 - Customer Service Representatives and Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products have an overall compatibility index of 93 out of a score of 100 where 100 indicates complete compatibility. As can be seen in Figure 53, the biggest knowledge gap between the two occupations is in the knowledge of sales and marketing, followed by administration and management. This knowledge is likely to be

obtained through a four-year college; roughly three-fourths of sales representatives have a bachelor's degree.

- The skills and abilities of the two occupations have even more overlap. This includes skills such as critical thinking, active listening, speaking, time management, and complex problem solving. Important overlapping ability levels include problem sensitivity, inductive and deductive reasoning, oral comprehension, speech clarity, and written expression.
- Occupations that have higher educational requirements and skills also provide correspondingly higher wages for workers. In 2017, the median hourly wage for a Customer Service representative in the greater Wichita region was \$13.99 while Wholesale and Manufacturing Sales Representatives received a median hourly wage nearly double that at \$27.32.
- Roughly 13 percent of Sales Representatives in the greater Wichita region are employed in the aerospace product and parts manufacturing sector; 8.4 percent in the professional and commercial equipment and supplies merchant wholesalers sector; and 6.9 percent in machinery, equipment, and supplies merchant wholesalers sector.

FIGURE 54: MID-TECH AND HIGH-TECH COMPUTER AND MATHEMATICAL OCCUPATIONS, 2016

Occupation	Employment	Sub-B.A. Share	B.A. Share	Advanced Share
Mid-tech occupations	914,770	38.6%	49.0%	12.5%
Computer Network Architects	157,070	52.2%	43.5%	4.4%
Computer Network Support Specialists	188,740	49.7%	48.8%	1.5%
Computer Systems Analysts	568,960	31.1%	50.5%	18.3%
High-tech occupations	2,112,090	7.4%	75.3%	17.2%
Computer Programmers	271,200	22.2%	77.6%	0.3%
Computer Occupations, All Other	261,210	16.0%	69.1%	15.0%
Information Security Analysts	96,870	12.0%	87.8%	3.2%
Database Administrators	113,730	8.0%	76.6%	15.5%
Software Developers, Systems Software	409,820	4.8%	78.4%	16.5%
Software Developers, Applications	794,000	4.6%	79.7%	15.6%
Statisticians	33,440	1.7%	42.0%	56.3%
Actuaries	19,940	0.0%	66.7%	33.3%
Mathematicians	2,730	0.0%	20.8%	79.2%
Operations Research Analysts	109,150	0.0%	29.6%	70.4%

Source: Brookings Institute; Brookings analysis of O*Net and OES data

- ✓ Additionally, many Digital Network Services and Cybersecurity tech jobs are held by workers without bachelor's degree. Tech jobs that are held by workers without a bachelor's degree provide a valuable opportunity and path for greater earning potential for individuals in the region without a four-year degree. The Brookings Institute recently did a study into the educational attainment rates of the tech workforce in the U.S. for 13 high-tech occupations that comprise the BLS-define computer and mathematical occupation group. Their findings can be seen in Figure 54 and support the assertion that mid-tech jobs are a real, quality employment opportunity for a wider range of individuals, including those without a college degree.
- ✓ As noted previously, key ICT technologies are converging in their application to business services, products, and operations. This convergence directly impacts the benefits ICT firms can supply to clients in multiple industry sectors. The following sections provides examples of how the Information Technology Systems and Support sector, especially the Digital Network Services and Cybersecurity niche, can be leveraged for "platforms" applied to other business sectors in the greater Wichita region.
 - **Advanced Manufacturing and Materials:** Technology is, and will continue to, transform the factory floor across the world. In order to compete with low labor cost countries, North American manufacturers are increasingly adopting automation and robotics technologies to maximize outputs and cut costs. Interconnected sensors that provide real-time production data, augmented reality technologies that enhance worker capability, and rapid prototyping that reduces product-development costs and turnaround times are changing the nature of modern manufacturing. Technological advances increase productivity but often at the expense of employment growth. Today's manufacturing firms increasingly seek employees with computer and coding competency, mathematical literacy, team collaboration and communication skills, and the willingness to continuously enhance their knowledge base. Global demand will drive technology-adopting and productivity optimization.

Information Technology Systems and Support is most prominent in software driving additive technologies such as 3D printing in this sector. These innovations are transforming the factory floor and completely reshaping supply chains and just-in-time production processes. The time and cost required to design, and prototype certain new parts and products have been greatly reduced. Not only does this make domestic production of these outputs more cost-competitive, it also democratizes production to the extent that small to medium-sized manufacturers are much more competitive against large firms that used to leverage resource advantages to price smaller companies out of the market. Support can be provided to entrepreneurs and smaller firms to utilize these additive technologies to innovate new products for multiple sectors.

- **Aerospace:** At NIAR, research and development into artificial intelligence and machine learning for Aerospace has been ongoing for years to support innovation in the regional cluster. Advances developed for integration into Aerospace will could serve as opportunities to enhance the competitive position and growth of sector firms. As previously mentioned,

the use of Unmanned Aircraft Systems (UAS), commonly referred to as drones, is a quickly growing subset of the Aerospace sector. Its use can be applied to various commercial applications such as monitoring, surveying and mapping, precision agriculture, aerial remote sensing, and product delivery, in addition to the growth in usage of military UAVs worldwide.

NASA is also pursuing research in on-demand mobility (ODM) technologies. For aviation, ODM refers to the ability to quickly and easily move people or equivalent cargo without delays introduced by lack of or infrequently scheduled service. Greater Wichita's aviation firms agreed to partner to attract a NASA ODM workshop to Wichita that ultimately located elsewhere.

- **Agriculture:** Drone technology is revolutionizing the Agriculture sector. As previously mentioned, innovations such as precision agriculture allow farmers to manage crops and ensure efficiency of inputs like water and fertilizer while maximizing productivity, quality, and yield. Through drones, farmers are able to constantly monitor crop and livestock conditions and identify problems that cannot be seen from the ground-level. Automation and GPS guidance allows the drone to map and survey the ground and takes pictures using onboard sensors and a built-in camera. Internet of Things enabled smart wireless sensors connected to farm operations centers to transmit up-to-the-second information about crop conditions and equipment performance. Artificial intelligence/machine learning applications can ensure that farm equipment "learns" how to optimize planting and harvesting in real-time.

The field of robotics in the farm industry is also expanding and creating new ways to incorporate automation into the agriculture sector. The use of automated harvesting equipment and other advanced technology to perform tasks such as pruning, seeding, planting, and weeding is largely motivated by the worsening labor shortage due to aging and the lack of interest and skilled workers in agriculture. One example of how machines are being developed to replicate delicate farming jobs is a new white asparagus-picking robot. In order to perform the task of selective harvesting, it uses special hi-tech sensors.

- **Healthcare:** The digitization of health records is the tip of the iceberg in terms of ICT's impact on the business of healthcare. Advances in data gathering and analytics are transforming caregivers' ability to diagnose, manage, and sustain the health and wellness of their patients. Savings accrued from these advances will help lower costs and free up clinicians to focus on the practice of medicine. Big Data technologies are also driving adoption of "precision" medicine treatments that leverage genetic profiles, patient histories, and state-of-the-art methodologies to customize health and wellness protocols and disease treatments. Genomics is the key technology underlying precision medicine and provides tremendous opportunities to apply data analytics to the practice of patient care. Artificial intelligence and robotics innovations are leading to the development of microscopic robots that intravenously attack bacteria and disease. Advances in virtual reality and 3D imaging are improving the training of physicians and are revolutionizing diagnostics and surgical practices.

- **Oil and Gas:** Applying artificial intelligence technologies and incorporating automation into oil and gas activities can help boost production and efficiencies. Sensors can now measure variables such as corrosion and vibration and hazardous leaks in pipelines and wirelessly communicate that information back to operations managers to inform maintenance and product development protocols. Innovative software and use of analytics gives Oil and Gas companies the information they need to make better predictions and save money. One example is End-to-end Exploration and Production (E&P) solutions, which help to increase efficiently and improve the return on investment. Companies are able to maximize production and avoid nonproductive drilling and wasteful exploration spending by having better data and a better understanding of existing brownfield assets.

The use of robots and drones is also making its way into the oil industry. Offshore, BP recently started sending robots to check pipes for microscopic metal cracks connecting the oil facility to the sea floor. Drones are being used to inspect gear high up on floating rigs. These technologies are being explored for onshore operations to utilize robots and drones to cut costs, improve safety, reduce the scope for human error, and alleviate workforce shortages in certain occupations. Autonomous haulers and other vehicles are also being integrated into Oil and Gas operations to improve efficiency and address current and future workforce shortages.

- **Transportation and Logistics:** The use of mobile computers, GPS solutions, electronic tolling, electronic vehicle logs, and other information technologies are already helping to improve efficiencies in logistics companies. In the future, fleet management systems will be able to optimize routes using real-time traffic data, improve vehicle utilization, and automatically track truck driver hours and reporting information. Telematics functions will make it possible to track vehicle maintenance needs and generate engine alerts. Companies will also be able to track speeding, harsh braking, excessive idling, and other conditions that will reduce fuel consumption and costs and improve safety.

Driverless vehicles are continuing to make advancements as new technology is developed and tested. Onboard technology includes an array of sensors and self-driving software to enable the computer to operate the truck autonomously. In February 2018, a self-driving truck completed a test run from Los Angeles to Jacksonville, Florida. Embark has also been hauling refrigerators 650 miles from its warehouse in El Paso, Texas to a distribution center in Palm Springs, California. The trucks currently have a human driver that rides in the cab to monitor the computer, but the goal is to ultimately let trucks drive autonomously. Autonomous trucks would help to alleviate the workforce strain due to the lack of truck drivers in the transportation sector. The American Trucking Association estimates that the truck driver shortage could reach 175,000 drivers by 2024 due to retirements and an insufficient supply of younger drivers.

Oil and Gas

DEFINITION: Oil and Gas is a key legacy sector in the greater Wichita region and a principal industry of community, Butler County. This target is composed of two niches: the production, processing, and distribution of oil and gas, and the manufacturing of petroleum-based byproducts. The production, processing, and distribution of oil comprises establishments involved in the exploration and production of crude petroleum and natural gas, refining, and pipeline transportation. Petroleum-based products include items such as personal care and cleaning products, lubricating oils, and dyes and pigments, among other products.

FIGURE 55: THE GREATER WICHITA REGION OIL AND GAS SECTOR ACTIVITY, 2012-2017

NAICS	Subsector	2017		5-yr Chg. (2012-17)				Earnings	
		LQ	Jobs	#	%	KS %	US %	2017	% of US
Production, Processing, and Distribution									
2111	Oil & Gas Extraction	1.34	520	(192)	-27.0%	-22.0%	-16.7%	\$70,809	43.3%
2131	Support Activities for Mining	0.82	553	(524)	-48.6%	-43.1%	-31.6%	\$53,912	64.0%
4861	Pipeline Transportation of Crude Oil	1.86	53	14	34.5%	-42.9%	24.3%	\$76,743	66.3%
4862	Pipeline Transportation of Natural Gas	2.64	186	43	30.6%	49.2%	4.2%	\$86,242	62.9%
4869	Other Pipeline Transportation	5.88	123	56	83.6%	-24.6%	27.0%	\$115,365	98.3%
324110	Petroleum Refineries	6.58	1,126	40	3.7%	2.2%	-2.1%	\$106,894	79.3%
541360	Geophysical Surveying & Mapping Services	2.91	112	(53)	-32.1%	-24.4%	-18.1%	\$55,332	70.7%
Petroleum-Based Products									
3255	Paint, Coating, & Adhesive Mft.	1.01	152	2	1.3%	-3.5%	6.2%	\$58,306	78.5%
3256	Soap, Cleaning Compound, & Toilet Preparation Mft.	0.06	16	N/A	N/A	-0.9%	4.4%	\$48,415	67.3%
3259	Other Chemical Product & Preparation Mft.	0.11	21	(27)	-56.3%	-16.6%	-3.4%	\$66,566	95.6%
324191	Petroleum Lubricating Oil & Grease Mft.	17.55	467	127	37.3%	16.9%	6.0%	\$63,982	81.6%
325130	Synthetic Dye & Pigment Mft.	21.61	681	591	655.9%	661.6%	-3.2%	\$120,314	146.3%
Total, Target Sector		1.94	4,011	94	2.4%	-19.8%	-15.4%		
Total, All Jobs			390,174	6,223	1.6%	2.7%	7.6%	\$42,394	81.1%

Source: Economic Modeling Specialists International (EMSI)

Note: Earnings ratio refers to the ratio of local earnings (wages plus supplements) to the national average for that same sector. This helps provide an important perspective on the relative cost of labor in a community. Location quotients (LQs) measure the relative concentration of regional employment in a given business sector. Specifically, they are calculated by dividing a sector's share of regional employment by that sector's share of national employment. A location quotient above 1.0 would indicate that the sector is more heavily concentrated in the region than it is nationally. Color-coding: Employment growth is color-coded such that growing sectors are presented in green text and declining sectors in red text. Those with location quotients greater than or equal to 1.1 are presented with a green dot. LQs lower than 0.9 are presented with a red dog and LQs between 0.9 and 1.1 with a yellow dot.

KEY LOCAL EMPLOYERS: BG Products, National Coop Refinery Association, Holly Frontier El Dorado Refining Co., Universal Lubricants LLC, Trans Pacific Oil, Lubrication Engineers, Kyodo Yushi Manufacturing Americas

REGIONAL OVERVIEW: The Oil and Gas industry in Kansas supports roughly 118,000 jobs across the state. The greater Wichita region also has long history in the Oil and Gas sector, where it continues to be an important economic driver. The sector accounts for roughly 4,000 jobs, with employment growing locally despite declines at the state and national level. Across the country, the Oil and Gas sector suffered heavy

losses when crude oil prices fell by 60 percent since 2014. In the greater Wichita region, growth in manufacturing of petroleum-based products has helped to offset losses in oil and gas extraction activities over the past five years tied to the drastic drop in crude oil prices experienced in 2015 and 2016.

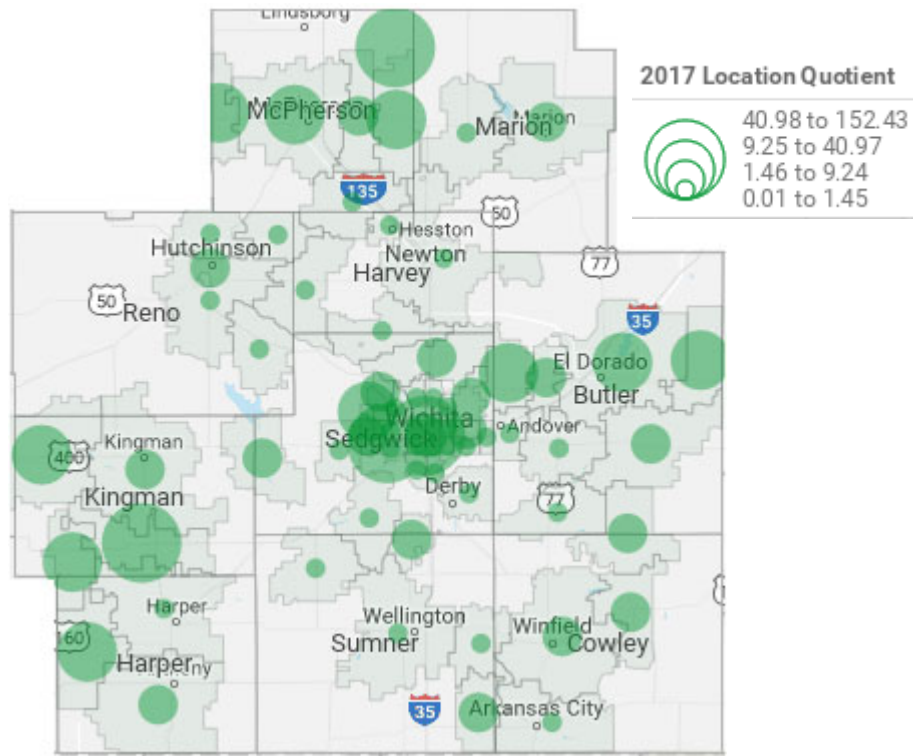
NATIONAL TRENDS AND MARKET OUTLOOK: The U.S. Energy Information Administration's (EIA) most recent International Energy Outlook projects that world energy consumption will grow by 28 percent between 2015 and 2040.^{xxvii} The EIA projects that fossil fuels will account for more than three-quarters of world energy consumption through 2040. Although renewables and nuclear energy are projected to grow at faster rates than fossil fuels, world petroleum and other liquid fuels are projected to account for 31 percent of the world's energy consumption in 2040. Employment in the production, processing and distribution of oil and gas is projected to increase by 2.9 percent between 2017 and 2022. Oil and extraction is projected to add the most number of jobs (+8,136) while pipeline transportation of crude oil is projected to grow the fastest (+16.6 percent).

Despite projections that fossil fuel use will not peak until mid-century, the recent downturn in oil and gas prices is nevertheless causing companies to re-imagine their energy portfolios and, at the same time, improve top line performance of existing assets.^{xxviii} Helping to drive the latter are automation, machine learning, and Internet of Things technologies, exemplified by the 2017 merger of General Electric and Baker Hughes. The newly consolidated oil and gas division expects automation to play a central role as the company adjusts to the new reality of fossil fuel prices. New technologies could also lessen the impact of worker retirements in the oil and gas sector. Some estimate that half of the traditional energy sector's workforce could retire by 2025.^{xxix}

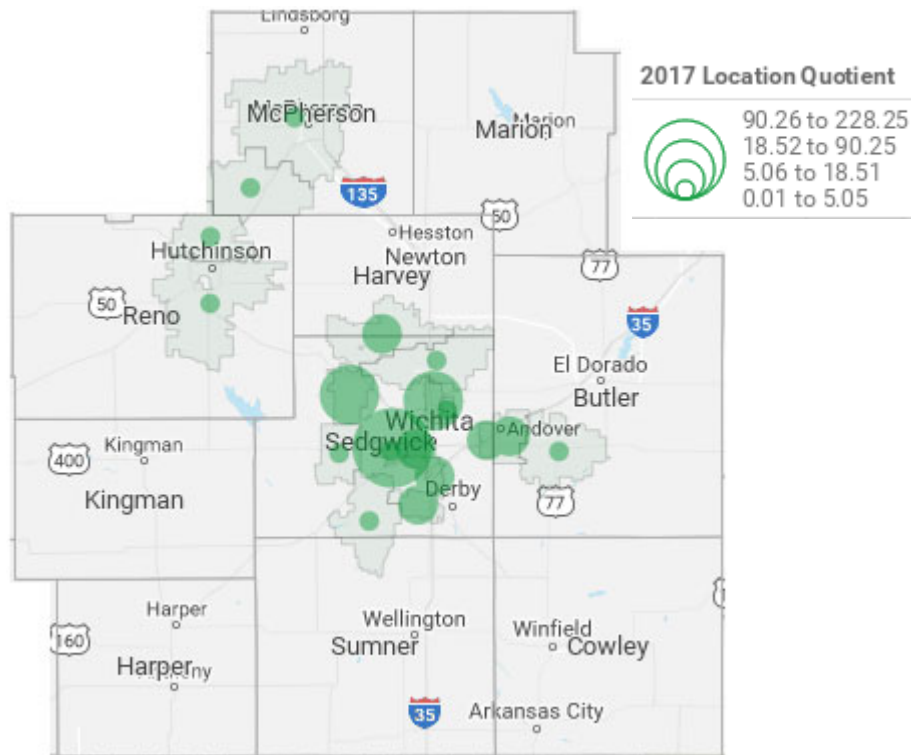
GEOGRAPHIC DISTRIBUTION: The Production, Processing, and Distribution niche of Oil and Gas is clearly the most highly concentrated in the greater Wichita region's rural counties. McPherson, Butler, and Kingman counties feature especially strong presences of this niche. However, firms in this segment are found in notable concentrations across the greater Wichita region.

Conversely, the Petroleum-Based Products niche is one of the more localized specializations in the region. McPherson, Reno, and Sedgwick possess the vast majority of employment in this segment.

FIGURE 56: GEOGRAPHIC CONCENTRATIONS OF PRODUCTION, PROCESSING, AND DISTRIBUTION NICHE



Source: Economic Modeling Specialists International (EMSI)

FIGURE 57: GEOGRAPHIC CONCENTRATIONS OF PETROLEUM-BASED PRODUCTS NICHE


Source: Economic Modeling Specialists International (EMSI)

KEY FINDINGS AND STRATEGIC CONSIDERATIONS

- ✓ The Oil and Gas sector in the greater Wichita region is made up of many small employers. The average size of an establishment in the oil and gas extraction sector is 3.9 employees. According to the Kansas Independent Oil and Gas Association (KIOGA), small independent oil and gas produced account for 92 percent of the oil 63 percent of the natural gas produced in the state. There are a number of organizations in place such as KIOGA and the Eastern Kansas Oil and Gas Association (EKOGA) to organize and communicate the interests of oil and gas producers, suppliers, and distributors on matters affecting the industry.
- ✓ The region has multiple refineries to support the oil and gas business sector. With roughly 1,100 jobs, employment at petroleum refineries is 6.5 times more concentrated than national average. Employment at petroleum refineries increased slightly (+3.7 percent) over the past five years.
- ✓ Four major lubricant manufacturers in the greater Wichita region represent a significant concentration compared to most Oil and Gas intensive regions. A local stakeholder in this segment believes that the sub-sector represents a major growth opportunity for the region due to its trained workforce and central location for delivery to auto plants.

- A recent joint venture between Wichita-based Lubrication Engineers and Kyodo Yushi USA, one of the world's leading grease manufacturers, is an example of international interest in the region's lubrication sector. The two created a new company, Kyodo Yushi Manufacturing Americas, to produce lubricants for the automotive industry at the Maize Industrial Park.
- ✓ Similar to the Agriculture sector, companies in Oil and Gas primarily operate in the more rural parts of the region where broadband quality and connectivity is an issue. As new ways in which technology can be used to improve efficiencies in the oil and gas field are developed, companies and individuals will need to have fast and reliable broadband connectivity in order to compete.
- ✓ There are several higher education programs in place to support the talent pipeline in Oil and Gas. WSU's geology program offers a bachelor's degree, as well as a master's degree through its Earth, Environmental, and Physical Science (EEPS) program. Geologists are an important workforce component to Oil and Gas production, extraction, and exploration activities. WSU's Geology Building houses a comprehensive rock, mineral, and fossil collection; optical mineralogy and petrology laboratory; carbonate sedimentology laboratory; and state of the art software for applications in petroleum exploration geology and GIS. Nearby, the Washburn University School of Law's Oil and Gas program prepares students for the contemporary practice of oil and gas law and related fields. The program was developed to help meet the ongoing and ever-changing demands of the industry.

FIGURE 58: OIL AND GAS SUBSECTOR EXPORTS, 2017

NAICS	Industry	Exports
324110	Petroleum Refineries	\$3,651,267,096
2111	Oil and Gas Extraction	\$1,961,186,332
325130	Synthetic Dye & Pigment Mft.	\$546,659,866
324191	Petroleum Lubricating Oil & Grease Mft.	\$233,480,623
3255	Paint, Coating, and Adhesive Manufacturing	\$67,331,209
4869	Other Pipeline Transportation	\$50,605,612
4862	Pipeline Transportation of Natural Gas	\$23,326,083
2131	Support Activities for Mining	\$14,649,970
541360	Geophysical Surveying & Mapping Services	\$9,422,839
3259	Other Chemical Product and Preparation Manufacturing	\$4,574,691
4861	Pipeline Transportation of Crude Oil	\$2,196,046
3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	\$1,810,016
Total Target Exports		\$6,566,510,382

Source: Economic Modeling Specialists International (EMSI)

 Note: The export figures show the amount of money that is spent by industries located outside the region in exchange for goods or services produced by each industry located in the region. Exports include both foreign and domestic.^{xxx}

- ✓ As can be seen in the previous figure, the Oil and Gas sector's regional exports topped \$6.5 billion in 2017. Petroleum refineries were the largest exporters in the region, over double the total of oil and

gas extraction firms. Input participants noted that it is unlikely that new refineries will be attracted to the region but stressed that expansion of existing operations is a key opportunity, citing the recent acquisition by Holly Energy of a 50 percent interest in Frontier Aspen.

- ✓ The Oil and Gas sector offers high paying employment opportunities for the region's workforce. All 12 subsectors in the target have average wages above the regional average for all jobs. Many of the subsectors have average wages double or even triple the regional average.
- ✓ The sector also offers quality employment opportunities for individuals at all skill levels. Roughly 60 percent of jobs in production and distribution of Oil and Gas¹ have a high school diploma as the typical entry level education requirement. Approximately 22 percent require a bachelor's degree. That said, input participants reported that the time and cost of training workers can be a heavy burden on some employers. Many of the jobs are skilled and require on-the-job training. Roughly 41 percent of jobs require moderate-term on-the-job training while 9.5 percent require long-term on-the-job training.² One of the outcomes of the 2015 BREG process was the development of career pathway maps for all clusters.
- ✓ The greater Wichita region possesses a high concentration of workers in many of the core competencies required to support growth in the oil and gas sector. The following list of occupations is a sample of some of these occupations and the relevant data regarding their presence in the greater Wichita region workforce.
 - Petroleum Pump System Operators, Refinery Operators, and Gaugers: With nearly 600 jobs in this occupation through the greater Wichita region, employment is highly concentrated (LQ=5.73). Employment increased over the past five years by 16.8 percent, despite a national decline. The average hourly wage was \$32.41 in 2017.
 - Wellhead Pumpers: Employment is down over the past five years and is tied to the decline in drilling as a result of lower global oil prices. Employment remains highly concentrated in the local economy (LQ=2.35). The average hourly wage was \$24.81.
 - Industrial Machinery Mechanics: There are over 1,600 jobs in the greater Wichita region. This occupation supports a variety of sectors including the agriculture sector. Employment is nearly two times more concentrated than the average US community. This job pays well with an average wage of \$27.17.
- ✓ Poor perceptions regarding the Oil and Gas sector in the greater Wichita region is reportedly contributing to a talent shortage for workers. Input participants noted that attention to and strong growth in renewable energy has led many high school students and other young workers to believe that Oil and Gas is a "dying sector." As a result, many refuse to consider related occupations as a

¹ NAICS codes 2111, 2131, 4861, 4862, and 4869

² The Bureau of Labor Statistics defines moderate-term on-the-job training to be more than 1 month and up to 12 months. Long-term on-the-job training is defined as more than 12 months.

viable career path, despite data estimates from the EIA that show that fossil fuels will account for more than three-quarters of world energy consumption through 2040.

- Kansas Strong, a nonprofit organization funded by oil and natural gas producers and other Kansas industries, is working to educate and inform people about the role that Oil and Gas plays in the community. The organization works to educate students and the public about career opportunities available in the oil and gas sector.
- ✓ As with other sectors, the Oil and Gas industry is faced with challenges associated with an aging workforce. Nearly half of workers in the oil and gas extraction sector are over the age of 55. In petroleum refineries, 33 percent of workers are over the age of 55 while 32 percent of employees at support activities for mining are over the age of 55. In comparison, 24 percent of the total workforce in the greater Wichita region meets this threshold.
- ✓ The talent shortage in Oil and Gas spans multiple skill levels. While this is partially due to an aging workforce and potentially poor perceptions of the industry, the cyclical nature of the industry further exacerbates the issue. Following layoffs in 2015 and 2016, many Oil and Gas workers switched industries or left the region to look for work. As activity begins to pick back up and demand for workers increases, input participants reported difficulties in finding skilled talent. In 2017, there were roughly half as many rotary drill operators and roustabouts working in the region as 2012. Similar to other business sectors in the greater Wichita region, the Oil and Gas sector is also dealing with a shortage of CDL drivers.
- ✓ While the greater Wichita region's Oil and Gas firms do not invest significant amounts into research and development, stakeholders said that firms would nevertheless be interested in understanding how emerging technologies can be incorporated into their operations to enhance competitiveness. This provides an opportunity for WSU researchers and economic development entities to work with employers to determine the highest value technologies to consider for pursuit.
 - For example, additive manufacturing will play a major role in Oil and Gas production innovation. Several GE businesses including Aviation, Oil and Gas, Power, and Healthcare are already benefitting from the technology. Per GE, "Working closely with engineers at GE Global Research, who built one of the first laser-powered 3D printers in the early 1990s, GE Additive recently opened the Additive Training Center (ATC) near Cincinnati. The 130,000-square-foot facility holds some 30 machines that print metal and as many as 40 machines that print plastic. Several times a year, the ATC holds a 'Manufacturing Boot Camp.' It trains hundreds of engineers, who then fan out across GE to spread the additive gospel."

Transportation and Logistics

DEFINITION: Most finished goods begin as raw inputs that must be transported to a manufacturer. When the production process is complete, the resulting goods must be conveyed to a user – a consumer, business, or other manufacturer. These activities are captured in the transportation niche of the Transportation and Logistics target.

The logistics niche includes business establishments such as distribution centers and warehouses, as well as companies that coordinate and arrange for the transportation of goods and materials such as third-party logistics providers (3PLs) and supply chain consulting firms. It also captures establishments engaged in wholesale trade. Unlike individual households, businesses, governments, and institutions typically purchase goods from wholesalers – intermediary establishments that acquire and distribute all manner of materials and goods. Wholesalers may be vertically integrated divisions of manufacturers or retailers or standalone entities. In addition to their role in storing and distributing goods, wholesalers often provide other services to manufacturing establishments, including marketing, business development, sales support, and supply chain coordination. The greater Wichita region's robust manufacturing economy has created an equally dynamic Transportation and Logistics sector to manage these complicated supply chains.

FIGURE 59: THE GREATER WICHITA REGION TRANSPORTATION & LOGISTICS SECTOR ACTIVITY, 2012-2017

NAICS	Subsector	2017		5-yr Chg. (2012-17)				Earnings	
		LQ	Jobs	#	%	KS %	US %	2017	% of US
Transportation									
4821	Rail Transportation	● 1.66	899	(26)	-2.8%	-6.8%	-5.1%	\$91,343	98.6%
4841	General Freight Trucking	● 0.85	2,463	144	6.2%	8.1%	6.6%	\$48,700	101.5%
4842	Specialized Freight Trucking	● 0.98	1,123	76	7.3%	1.2%	7.0%	\$40,205	82.9%
4882	Support Activities for Rail Transportation	● 1.99	163	93	131.8%	-3.7%	23.8%	\$57,075	111.4%
4884	Support Activities for Road Transportation	● 0.83	236	21	9.8%	6.6%	19.0%	\$33,169	86.7%
4885	Freight Transportation Arrangement	● 0.72	415	118	39.8%	-20.0%	16.2%	\$41,943	71.1%
4889	Other Support Activities for Transportation	● 0.41	34	(28)	-45.3%	-48.0%	14.4%	\$47,289	111.8%
Logistics									
4231	Motor Vehicle & Motor Vehicle Parts & Supplies Merchant Wholesalers	● 1.11	935	(175)	-15.8%	6.9%	3.7%	\$43,280	76.4%
4233	Lumber & Other Construction Materials Merchant Wholesalers	● 0.78	427	64	17.5%	7.9%	19.6%	\$53,647	86.8%
4235	Metal & Mineral (except Petroleum) Merchant Wholesalers	● 1.80	546	(6)	-1.2%	16.6%	1.1%	\$54,508	80.9%
4236	Household Appliances & Electrical & Electronic Goods Merchant Wholesalers	● 0.56	454	68	17.7%	4.9%	3.8%	\$58,399	67.6%
4237	Hardware, & Plumbing & Heating Equipment & Supplies Merchant Wholesalers	● 0.70	441	15	3.5%	20.5%	13.5%	\$64,660	97.6%
4238	Machinery, Equipment, & Supplies Merchant Wholesalers	● 1.57	2,553	(310)	-10.8%	-7.4%	2.0%	\$59,968	87.0%
4239	Miscellaneous Durable Goods Merchant Wholesalers	● 0.46	352	(143)	-28.8%	-16.1%	-5.6%	\$42,121	77.9%
4245	Farm Product Raw Material Merchant Wholesalers	● 3.65	664	17	2.6%	6.7%	-0.8%	\$40,646	78.5%
4246	Chemical & Allied Products Merchant Wholesalers	● 0.72	231	54	30.6%	-0.3%	3.5%	\$62,794	75.6%
4247	Petroleum & Petroleum Products Merchant Wholesalers	● 3.22	763	177	30.3%	17.6%	0.6%	\$98,791	126.0%
4248	Beer, Wine, & Distilled Alcoholic Beverage Merchant Wholesalers	● 0.86	411	16	3.9%	6.2%	12.7%	\$49,159	73.0%
4249	Miscellaneous Nondurable Goods Merchant Wholesalers	● 0.88	720	(46)	-6.0%	-3.4%	-1.6%	\$46,992	88.3%
4931	Warehousing & Storage	● 0.65	1,544	111	7.7%	47.7%	42.9%	\$45,011	105.2%
541614	Process, Physical Distribution, & Logistics Consulting Services	● 0.53	170	76	81.4%	77.8%	19.6%	\$38,586	55.8%
Total, Target Sector		● 0.98	15,542	316	2.1%	6.8%	9.7%		
Total, All Jobs			390,174	6,223	1.6%	2.7%	7.6%	\$42,394	81.1%

Source: Economic Modeling Specialists International (EMSI)

Note: Earnings ratio refers to the ratio of local earnings (wages plus supplements) to the national average for that same sector. This helps provide an important perspective on the relative cost of labor in a community. Location quotients (LQs) measure the relative concentration of regional employment in a given business sector. Specifically, they are calculated by dividing a sector's share of regional employment by that sector's share of national employment. A location quotient above 1.0 would indicate that the sector is more heavily concentrated in the region than it is nationally. Color-coding: Employment growth is color-coded such that growing sectors are presented in green text and declining sectors in red text. Those with location quotients greater than or equal to 1.1 are presented with a green dot. LQs lower than 0.9 are presented with a red dog and LQs between 0.9 and 1.1 with a yellow dot.

KEY LOCAL EMPLOYERS: BNSF, C.H. Robinson, King of Freight, Kustom Karriers, M. Bruenger & Co. Inc., Price Truck Line Inc., Savage Services Corporation, TranSystems, and Watco Companies, among others.

REGIONAL OVERVIEW: The Transportation and Logistics target has expanded over the past five years. Between 2011 and 2016, employment increased by 2.1 percent compared to 1.6 percent across the region for all jobs. The greater Wichita region's central location in the United States, interstate connectivity, Class I railroad access, available sites, flat topography, and lower cost structure make the region competitive for capturing future growth. Advantages like low-cost water in Butler County and low-cost utility rates in McPherson County are also differentiators. The greater Wichita region's aerospace, agriculture, and energy employment base also help to drive the movement of raw materials, agricultural crops, and finished goods, providing a strong basis for direct and back-haul shipping operations.

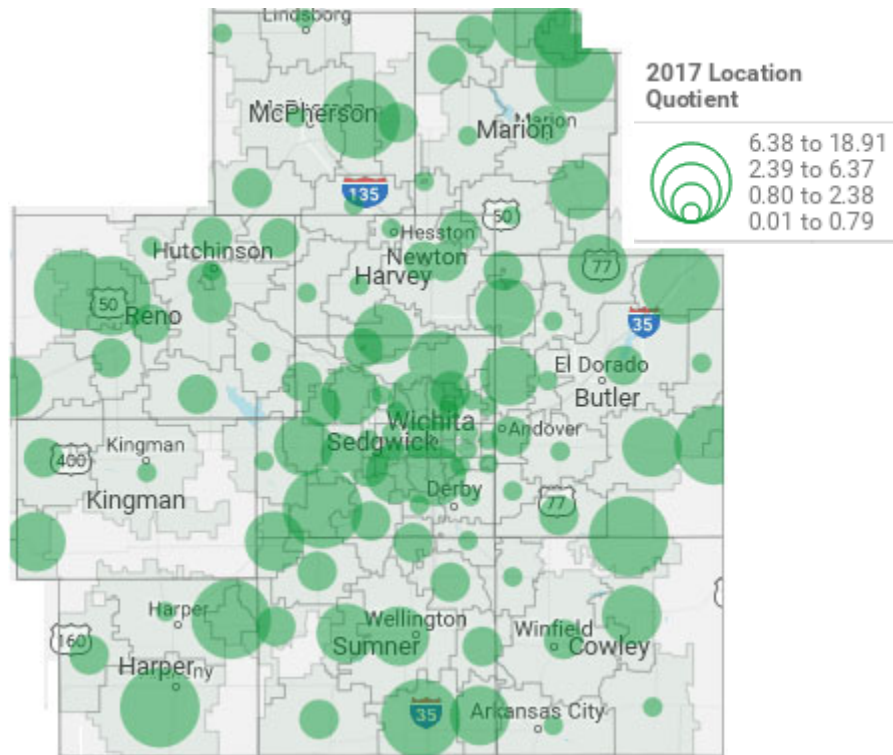
NATIONAL TRENDS AND MARKET OUTLOOK: U.S. employment growth in Transportation and Logistics outpaced that of the greater Wichita region; the national market outlook in Transportation and Logistics is also positive. Over the next five years, employment within this target is projected to grow by 5.5 percent nationally, slightly slower than the job growth of all jobs, 5.8 percent.

According to the American Trucking Association, trucking revenues were \$676.2 billion in 2016. Trucks moved 10.42 billion tons of freight, which accounted for 70.6 percent of all domestic freight tonnage. According to TMR, the global freight trucking market is project to grow by a combined annual growth rate of 5.6 percent between 2017 and 2025. A strong economy and boosts in consumer spending will help to drive growth in the trucking industry. Likewise, expansion of rail freight activity is projected to drive industry revenue growth. As the economy strengthens, demand will increase for rail shipping to support growth in other industries.

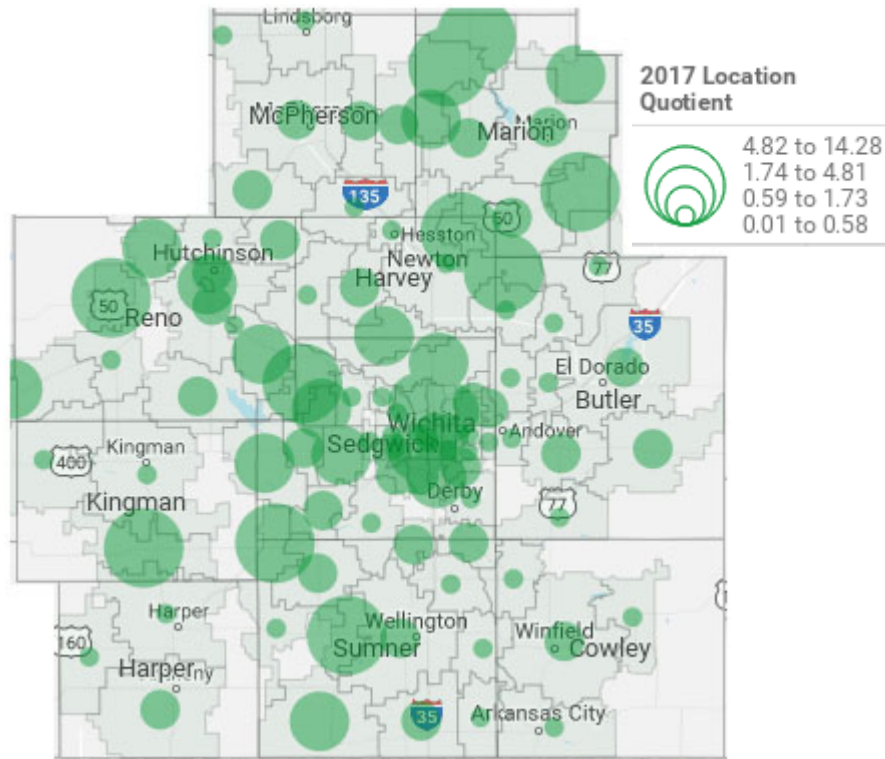
Among the greater Wichita region's subsectors in logistics, employment growth is projected to be driven largely by warehousing and storage. The rise of e-commerce and increase demand for faster shipping times is helping to drive growth within the sector as more retailers reconfigure their distribution systems. Increasingly, manufacturers and retailers have moved to outsourcing their warehousing and logistics needs to third-party providers. As technology advances, these 3PL providers are able to implement more complex services such as advanced labeling and ticketing and even order fulfillment and shipping. The recent spate of announcements by Amazon and other retailers of new fulfillment centers will likely continue as retail increasingly moves from brick-and-mortar locations to online marketplaces. Consumers spent \$453.46 billion on the web for retail purchases in 2017, a 16.0 percent increase in 2016. Online sales of physical goods are projected to surpass \$603 billion by 2021, nearly double the total in 2016.^{xxxii}

GEOGRAPHIC DISTRIBUTION: As the following maps attest, the Transportation and Logistics sector is the most widely dispersed of all the Regional Growth Plan targets in terms of concentration of employment overall and by niche category. Likely as a consequence of its diverse and comprehensive production economy, the greater Wichita region features a very competitive array of firms engaged in the warehousing, distribution, and supply chain management of finished goods and components.

FIGURE 60: GEOGRAPHIC CONCENTRATIONS OF TRANSPORTATION NICHE



Source: Economic Modeling Specialists International (EMSI)

FIGURE 61: GEOGRAPHIC CONCENTRATION OF LOGISTICS NICHE


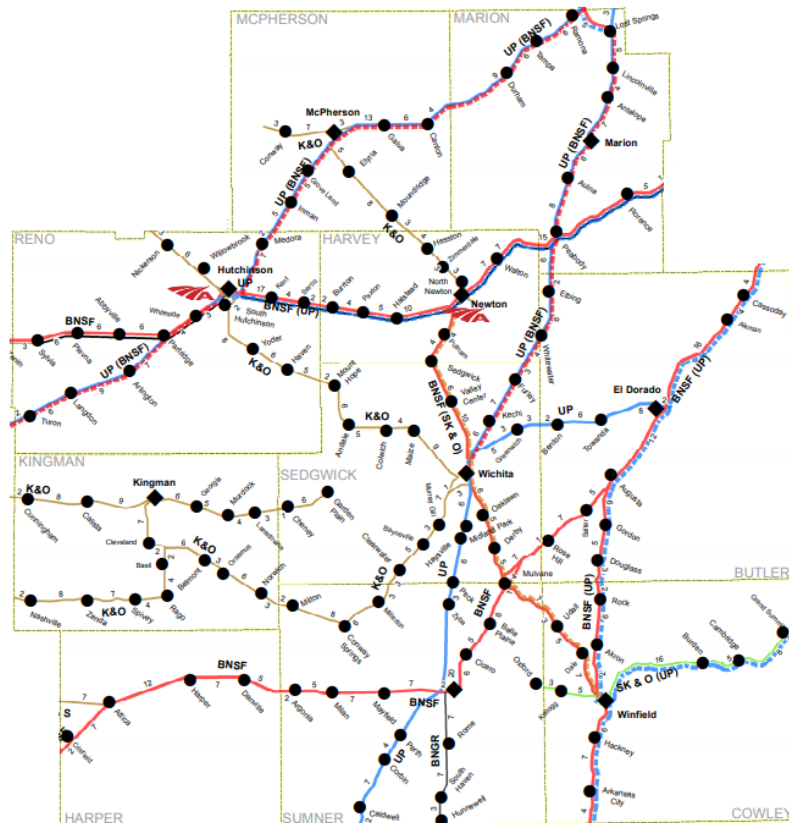
Source: Economic Modeling Specialists International (EMSI)

KEY FINDINGS AND STRATEGIC CONSIDERATIONS

- ✓ The Transportation and Logistics sector provides quality employment opportunities for the region's residents. Out of the 21 subsectors listed, 15 of them have higher average wages than the regional average of \$42,394. These are good-paying jobs at a variety of skill and education levels. As a component of 2015 BREG implementation, the Workforce Alliance, Kansas WorkforceOne, and partners from the education community developed a career pathway for logistics that lays out the educational requirements and career opportunities in the local community. The pathways detail employment opportunities, requirements, and pay for individuals considering a career in Transportation and Logistics. The region has several postsecondary degrees that align with this target, including WSU's new Global Supply Chain Management program.
- ✓ The greater Wichita region's diversity in production sectors can be seen in the wholesale side of logistics. Petroleum and petroleum products merchant wholesalers are three times more concentrated than the U.S. average. Raw material merchant wholesalers supporting the Agriculture sector has an LQ of 3.65 and has grown by 2.6 percent in the last five years. Additional wholesaling diversity is seen in strong employment totals for metal and mineral merchants; machinery, equipment, and supplies merchants; and motor vehicle and motor vehicle parts and supply merchants.

- ✓ As shown in the following map, the greater Wichita region has a solid base of infrastructure for moving goods. The region is primarily served by two Class I Railroads – BNSF and Union Pacific – with short-line access provided by Kansas and Oklahoma Railroad (KO). According to Area Development’s 32nd Annual Corporate Survey, proximity to customers and rail access are increasingly critical needs.
 - Stakeholders from the Transportation and Logistics and Agriculture sectors said it can often be difficult to convince the railroad industry to implement system enhancements, specifically new spurs to alleviate freight congestion and bypass weight limits on the region’s roads.

FIGURE 62: THE GREATER WICHITA REGION RAILROAD ACCESS



Source: Kansas Department of Transportation

- ✓ The Area Development survey also found that highway accessibility was the number one site selection factor, with 91.3 percent of respondents rating it as an “important” or “very important” factor in their site selection process. The projected growth in e-commerce will significantly increase the amount of freight on the region’s roads. In the 2018 Regional Growth Plan Strategic Survey, 72 percent of respondents felt that the region’s “road and highway capacity and accessibility” was an “advantage” or “significant advantage” to the region’s business climate. However, stakeholders from the Transportation and Logistics sector expressed concerns over sufficient funding to address local highway infrastructure issues.

- However, stakeholders also noted that the East Kellogg Expansion has been a positive recent development. Improvements aim to reduce congestion, increase capacity, ease travel in east Wichita, and upgrade Kellogg to a six-lane freeway with an interchange at Webb Road and Greenwich. The Kellogg/Greenwich to K-96 project construction is expected to be finished by late 2021. Input respondents noted that the lack of an east-west interstate in greater Wichita is a competitive issue.
- ✓ The greater Wichita region's proximity to Kansas City and its Logistics Park could pose challenges for developing an intermodal facility in Wichita. Previously, there were concerns expressed that Wichita is within a 250 mile radius of the facility, and therefore, too close to justify large-scale multi-model facility in Greater Wichita. However, others feel that an intermodal yard needed in the area and that sufficient demand exists to justify this investment.
- ✓ The regional workforce in the transportation niche is largely composed of heavy and tractor-trailer truck drivers, accounting for 43.8 percent of jobs in the niche. Median hourly earnings are competitive at \$19.77 per hour and rising, perhaps a factor in trucking employment's 7 percent growth from 2012 to 2017. Laborers and freight, stock, and material movers by hand represent 5.1 percent of workers in the niche. Employment within the occupation increased by 9 percent over the past five years. Logistics jobs are largely composed of sales representatives, stock clerks and order fillers, and customer service representatives. Combined, the three occupations account for roughly one-quarter logistics employment.
- ✓ Stakeholders from multiple the greater Wichita region sectors reported a shortage of CDL drivers. This is nationwide challenge as older truck drivers retire with an insufficient supply of younger workers to replace them. The American Trucking Association estimates that the current truck driver shortage is roughly 50,000 workers but could reach 175,000 by 2024. Even so, the greater Wichita region lacks formal, accredited training capacity to grow truck drivers locally, which further aggravates the situation.
 - As self-driving vehicle technology continues to advance, short-haul and long-haul trucking will increasingly become autonomous. According to a recent PwC and Manufacturing Institute Industrial Mobility report, 65 percent of U.S. manufacturers surveyed believe that self-driving trucks will be mainstreamed within the next ten years. Approximately 90 percent of U.S. manufacturers surveyed believe that full autonomous trucks could save up to 25 percent of their total trucking costs once mainstreamed. It is projections like these that are likely diminishing the desirability of trucking as a preferred occupation.
- ✓ The Wichita, Kansas Foreign Trade Zone (FTZ) provides the opportunity for regional exporting and importing firms to reduce operating costs. FTZs are general-purpose zones where foreign and domestic goods are considered outside of U.S. Customs territory. Users are thereby exempt from paying duty or federal excise taxes while goods remain in the zone or are exported. An FTZ zone is a de facto necessity for a region like the greater Wichita region with trillions of dollars in exports of aerospace and agricultural goods.

- ✓ Respondents to the online survey with knowledge of economic development felt that the greater Wichita region was deficient in certain categories of development product to support expansion and attraction of targeted employment. On the survey, availability of industrial sites and buildings and Class A office space had the highest percentages of respondents indicating that capacity was a significant disadvantage. This was more pronounced in terms of buildings as opposed to land. Economic developers noted that the supply of turnkey buildings with modern specifications is lacking in certain rural counties. The following list is a sampling of some of the area's land-based assets.
 - El Dorado has three industrial parks, one of which is full. There are 1,400 acres available. The city has the capacity to provide more than 10 million gallons (10mgd) of water daily to business customers. El Dorado is served by the main line of BNSF and a Union Pacific industrial lead line from Wichita.
 - The Kansas Enterprise Industrial Park in Hutchinson is fully serviced by electric, water, waste water, road, multi-lane highway, telecommunications, and rail access. It is home to Siemens Wind Energy.
 - The new Maize Industrial Park is another recent development that has had success in the past few years. The park broke ground in 2014 with 28 acres and is rail-serving. The industrial park is privately developed but the city of Maize has assisted in developing streets and other infrastructure for the park.
 - In Newton, its Kansas Logistics Park's goal is to facilitate growth by providing a valuable resource in overcoming the high costs of logistics and manufacturing. The Kansas Logistics Park is located just off of Interstate 135 and provides access to two Class I carriers as well as the WATCO short line railroad. The city has set aside over 400 acres for development of the park with substantial expansion capacity.
 - At the Sedgwick Industrial Park, there is partial rail access, while Ridge Road provides easy access to U.S. Highway 50 and Interstate 135.
 - Strother Field Industrial Park in Cowley County is located on U.S. Highway 77 and is 20 minutes from I-35 and approximately 45 miles southeast of the Wichita metropolitan area. The facility is identified as a regional airport within the Kansas Aviation System Plan.
- ✓ According to multiple stakeholders, the greater Wichita region could be doing more to capitalize on its specializations in market analysis, business analysis, and supply chain management. Input respondents said the presence of multiple headquarters' operations and the region's decades-long legacy of production-based employment has created a critical mass of analytical talent that could be applied to existing firms across multiple sectors or serve as a differentiator for attraction of outside firms.

ENDNOTES

- ⁱ “External economies and scale” and “network effects” refer to the power of agglomeration or “clustering” and the manner in which they produce efficiencies for clustered businesses. While “internal economies of scale” occur within an individual enterprise when costs decline as output increases, “external economies of scale” occur when costs (transportation, labor, communication/collaboration, and other business costs) decline for all businesses in area due to agglomerative effects.
- ⁱⁱ Note: The firm maintains key manufacturing operations in McPherson County, though its headquarters was relocated to Denver.
- ⁱⁱⁱ “The Skills Gap in U.S. Manufacturing 2015 and Beyond.” Deloitte and Manufacturing Institute. 2015.
- ^{iv} “Wichita in Megapolitan American: An Analysis of Wichita’s Potential Export Markets.” CEDBR. 2015.
- ^v TechSci Research is a research based global market consulting firm. Report accessed from: <https://www.techsciresearch.com/report/global-composites-market-by-fiber-type-carbon-fiber-composites-glass-fiber-composites-etc-by-resin-type-by-application-by-manufacturing-process-layup-filament-etc-by-region-competition-forecast-opportunities/1238.html>
- ^{vi} “Global Composites Market By Type (Glass Fiber & Carbon Fiber), By Application (Civil Engineering, Aerospace & Défense, & Others), By Manufacturing Process (Lay Up, Injection Moulding, etc.), By Region, Competition Forecast & Opportunities, 2012-2022.” TechSci Research. January 2018.
- ^{vii} Maintenance, Repair, and Overhaul (MRO) also includes other support activities for air transportation.
- ^{viii} “2016 Top Markets Report Aircraft Parts.” Department of Commerce. April 2016. Retrieved from https://www.trade.gov/topmarkets/pdf/Aircraft_Parts_Executive_Summary.pdf
- ^{ix} “2017 Aerospace Services Market Outlook.” Boeing. 2017.
- ^x “2017 Global Aerospace and Defense Industry Outlook.” Deloitte. 2017.
- ^{xi} Griffins, Laura. “How 3D printing is shaping the future of aircraft maintenance, repair & overhaul.” TCT Magazine. June 18, 2018.
- ^{xii} “2017 Annual Report.” “General Aviation Manufacturers Association (GAMA). 2017.
- ^{xiii} “Kansas Aviation Economic Impact Study.” Kansas Department of Transportation. 2017.
- ^{xiv} Marchio, Nick and Joseph Parilla. “Export Monitor 2018.” The Brookings Institution. April 30, 2018.
- ^{xv} “Spirit AeroSystems and WSU announce significant R&D, training agreement.” Wichita State University. April 5, 2018. Retrieved from <http://www.wichita.edu/thisis/stories/story.asp?si=3951>.
- ^{xvi} Kellner, Tomas. “Next-Generation Cessna Denali Will Have A 3D-Printed Turboprop Engine.” GE Reports. June 25, 2016.
- ^{xvii} Data was compiled from the 2017 country ag statistics produced by the Kansas Department of Agriculture. Retrieved <http://agriculture.ks.gov/about-kda/kansas-agriculture>
- ^{xviii} “World population projected to reach 9.8 billion in 2050, and 11.2 billion in 2100.” United Nations. June 21, 2017.
- ^{xix} Alexandratos, Nikos and Jelle Bruinsma. “World Agriculture Towards 2030/2050: The 2012 Revision.” Food and Agriculture Organization of the United Nations. June 2012.
- ^{xx} “Kansas Agriculture’s Economic Impact Report.” Kansas Department of Agriculture. August 2017.
- ^{xxi} “USDA Agricultural Projections to 2027.” USDA. February 2018.
- ^{xxii} “2018 Strategic Action Plans for Kansas Agricultural Growth.” Kansas Department of Agriculture. January, 24, 2018.
- ^{xxiii} “Estimate of the Impact of Physicians in the Kansas Economy.” WSU CEDBR. January 2016.
- ^{xxiv} “Measuring the economic pulse of Health Care and Related Industries on the Wichita Regional Economy, Vital Signs.” Medical Society of Sedgwick County. 2018.
- ^{xxv} “Middle-skills” jobs are those that demand further schooling and training than a high school diploma but less than a four-year college degree. These jobs have historically served as the springboard into the middle class, as the Harvard Business School notes in the 2014 report “Bridge the Gap: Rebuilding America’s Middle Skills.” Source: <https://nextcity.org/daily/entry/filling-in-the-missing-middle-skills-jobs-gap-in-chicago>
- ^{xxvi} Columbus, Lous. “2017 Roundup of Internet of Things Forecasts.” Forbes. December 10, 2017.
- ^{xxvii} “International Energy Outlook 2017.” U.S. Energy Information Administration. September 14, 2017.
- ^{xxviii} Biscardini, Giorgio, Reid Morrison, David Branson, and Adrian Del Maestro. “2017 oil and gas trends: adjusting business models to a period of recovery. PwC. 2017
- ^{xxix} Annunziata, Marco. “Digital Future of oil and gas and energy.” GE Oil and Gas. February 2017.
- ^{xxx} The input-output model in this report is Emsi’s gravitational flows multi-regional social account matrix model (MR-SAM). It is based on data from the Census Bureau’s Current Population Survey and American Community Survey; as well as the Bureau of Economic Analysis’ National Income and Product Accounts, Input-Output Make and Use Tables, and Gross State Product data. In addition, several Emsi in-house data sets are used, as well as data from Oak Ridge National Labs on the cost of transportation between counties.

^{xxi} Zroban, Stefany. "U.S. e-commerce sales grow 16.0% in 2017." DigitalCommerce 360, February 16, 2008. Accessed from: <https://www.digitalcommerce360.com/article/us-ecommerce-sales/>