"It is not the strongest of the species that survive, nor the most intelligent, but the ones most responsive to change"

Charles Darwin

"The World Wide Web is the fastest growing communications technology in world history. To reach an audience of 50 million people, it took radio 38 years and TV 13 years. It took the Internet only four years. And this year, traffic on the Internet is doubling every 100 days."

William T. Esrey
Chairman and CEO
Sprint Corporation
December 1, 1998

To the Citizens of Kansas:

The National Innovation Summit of the nation's corporate, government, academic and labor leaders spent two years studying the state of innovation in the United States. The 1998 summit announced national priorities for maintaining a vital U.S. economy. The priorities include:

- increasing the supply of science and engineering graduates,
- increasing federal investment in research,
- expanding university/industry/government collaboration to speed commercialization of ideas, and
- improving international patent protection and market access.

These national priorities are no less important to the economic future of Kansas, and The Kansas Innovation Index stands as a report card on our status and a guide for the corporate, academic, executive government and legislative leaders of Kansas.

The Index examines 33 indicators in four broad categories: Economic Structure, Innovation, Competitiveness, and Human Resources and Infrastructure. For each indicator, Kansas is compared to our neighboring states and U.S. averages, and, in some cases, to our own historical trends. The significance of each indicator is explained and Kansas' relative position is displayed in easily comprehended charts as well as descriptions.

What the Innovation Index tells us is that Kansas is favorably positioned to outperform other states in today’s knowledge-based economy. Kansas has a superior educational system and educated workforce. Kansas is home to key industry clusters which pay well above average wages. Kansas has also bred nascent industry clusters with the potential to become economic anchors. Exceptional growth will not occur of its own, though. Kansas still lags in research infrastructure, both human and physical in both university and industrial settings. Trailing indicators for R&D spending and faculty salaries are reflected in trailing indicators for SBIR awards, patents and licensing income. A below-average rank for company start-ups mirrors our unfavorable standing for local venture capital.

While the Index demonstrates a solid foundation upon which to build, it is also a call to action. Kansas stands at a decision point: Do we exert visionary leadership and choose our own future or do we accept the status quo and drift within the national tide? Kansas is poised to excel in a knowledge and innovation economy and will with a renewed commitment by its partners. KTEC's Strategic Plan can serve as a cornerstone for an integrated state action plan in which government, industry, and education would pull together toward a common vision of the State. The Kansas Innovation Index serves as a marker and a guide as Kansas stands at the gateway to its future.

Sincerely,

[Signature]

Richard A. Bendis
KTEC President

Kansas Innovation Index
KTEC thanks The Institute for Public Policy and Business Research at The University of Kansas, and the following people for their dedication and contributions to this project:

Dr. Charles E. Krider, Project Director & Director of IPPBR
Patricia Oslund, research
Susan M. Mercer, research
Laura Kriestrom Stull, graphic design
Somjit Barat, research
Thelma Helmar, editing
Alice Davidchack, research

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Sec. Allie Devine, Topeka, Secretary of Kansas Department of Agriculture
Sen. Paul Feleciano, Jr., Wichita, Kansas State Senator, (D)
Leroy Hayden, Satanta, President, Big Time Operators, Inc.
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Lt. Gov. Gary Sherrer, Topeka, Secretary of Kansas Department of Commerce & Housing
Lloyd T. Silver, Jr., Mission Hills, President, LSC, Inc.
William J. Wilhelm, Wichita, Dean, College of Engineering, Wichita State University
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*Kansas Innovation Index*
Executive Summary

The purpose of this report is to identify the Kansas innovation economy and to assess how well the state is positioned relative to the United States and the region. Increasingly, Kansas’ prospects for economic development are dependent on its ability to compete in the rapidly growing parts of the economy based on innovation. In terms of innovation, Kansas has strengths that can be built upon and weaknesses that can be improved upon. Attention to the state’s innovation strengths and weaknesses will increase opportunities for job and income growth.

**Kansas Innovation Economy.** The Kansas innovation economy refers to the state’s ability to generate new ideas through research and the ability to use those ideas to create new products and improved production processes. Those areas of the United States exhibiting the most rapid growth in high-wage job opportunities are those best able to support innovation from the creation of new ideas to the commercialization of those ideas into new products or new firms.

Included in the Kansas innovation economy are technology-based industries, often the home to very fast-growing small businesses. Also included are the research and education infrastructures essential to the innovation process. In a fundamental sense, the innovation economy is based on intellectual capital and on the ability to commercialize new ideas faster than other states. One requirement for success is to identify the industries in which Kansas has a critical mass so those industries can be supported. In turn, Kansas becomes a preferred location for those industries. A necessary goal is this: targeted Kansas technology-based industries will be competitive in national and global markets.

**What is Needed?** There are several essential requirements for Kansas to have a competitive innovation economy. First, Kansas must build on the set of technology-based industries that have critical mass: it is difficult to attract new industries to a state. Existing industries possess an infrastructure of a skilled workforce, research facilities and expertise, identified sources of capital, and a network of supplier firms. In short, a diverse set of industries with a track record of success with innovation provides a starting point for a state wishing to be competitive in the innovation sectors of the economy.

Second, a research infrastructure capable of generating new ideas and fostering them in the early stages of development is critical. Kansas lacks a significant number of corporate headquarters and their related research operations, and Kansas is a state of small businesses which do not have the capacity for stand-alone research facilities and staff. For these reasons, the state’s universities must be an important part of the research infrastructure. Enhancements in the research infrastructure of the three major research universities are critical for the Kansas innovation economy. The abilities to secure patents and to compete for federal research support are also important.

Third, if new ideas are to progress from the state’s research laboratories to commercially viable products, venture capital must be available. If entrepreneurs are to commercialize their ideas and new ventures in Kansas, a continuous flow of venture capital funds must be assured.

Fourth, the Kansas innovation economy requires an education and training system that prepares students and employees with needed skills. Of particular importance are trained engineers, mathematicians, and computer and natural scientists. The elementary and secondary school system must ensure that students are well trained in math and science. For Kansas to compete for technology-based industries, a trained,
well educated workforce is essential.

**How is Kansas Positioned?** The major finding of this report is that Kansas has a realistic opportunity to create a competitive advantage for economic growth in high growth and high wage industries by supporting its emerging innovation economy.

Kansas starts with a sufficient number of technology-based industries making an innovation-based development strategy feasible. While not the leading state with respect to innovation, Kansas has a base of industries that can become the foundation for growth. Examples include aircraft and aerospace, materials, information and communications technology, and printing and publishing. Also, of critical importance is the state’s highly educated workforce, including engineers. The state’s universities have an important research base and the Kansas state government is providing more support per capita for research and development than any other state.

However, the report also identifies some parts of the innovation economy that need strengthening. *Spending on research by Kansas’ businesses and universities is too low for Kansas to be a national leader in innovation.* Related weaknesses are in the areas of obtaining patents and competing for federal research and development. The availability of venture capital is insufficient to support the commercialization of research into commercial products at the necessary rate.

The Kansas Indicator Achievement Benchmark which follows summarizes how Kansas compares with the nation and the region on each of the indicators in this report. Regional comparison states include Arkansas, Colorado, Iowa, Missouri, Nebraska, and Oklahoma. A “+” or “++” in the table indicates that Kansas has a strength, a “-” or “-” indicates a weakness, and “o” indicates a neutral ranking. An indicator with a “+/−” has aspects that are strengths and weaknesses.

**Acknowledgement.** In 1997, the Massachusetts Technology Collaborative published its first *Index of the Massachusetts Innovation Economy*. Massachusetts has led the way in systematically assessing the strengths and weaknesses of a state’s technology and innovation. Kansas has benefitted greatly from the innovative efforts of Massachusetts in this arena.

“A necessary goal is this: targeted Kansas technology-based industries will be competitive in national and global markets.”
## Kansas Indicator Achievement Benchmark

<table>
<thead>
<tr>
<th>U.S.</th>
<th>Region</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>I. Kansas Economic Structure</td>
</tr>
<tr>
<td>+</td>
<td>+</td>
<td>Indicator 1: Key Industry Clusters and Diversity</td>
</tr>
<tr>
<td>+/-</td>
<td>+/-</td>
<td>Indicator 2: Employment Growth in Key Industry Clusters</td>
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<tr>
<td>+</td>
<td>+/-</td>
<td>Indicator 3: Wages and Wage Growth (in key industry clusters and overall)</td>
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<tr>
<td>+/-</td>
<td>+/-</td>
<td>Indicator 4: Real Wage and Employment Growth in High-Tech Industries (comparison with U.S.)</td>
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<tr>
<td>+</td>
<td>+</td>
<td>Indicator 5: Employment in High-Tech Industries (individual industries)</td>
</tr>
<tr>
<td>+</td>
<td>0</td>
<td>Indicator 6: High-Tech Wages and Employment (as share of total economy)</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>Indicator 7: Average Annual Wage (all industries)</td>
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<tr>
<td>0</td>
<td>0</td>
<td>Indicator 8: Median Household Income and Income Distribution</td>
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<tr>
<td>0</td>
<td>0</td>
<td>8a. Median Household Income</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>8b. Income Inequality</td>
</tr>
<tr>
<td>++</td>
<td>++</td>
<td>II. Kansas Innovation</td>
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<tr>
<td>+</td>
<td>+</td>
<td>Indicator 9: R&amp;D Spending by Universities and Industry</td>
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<tr>
<td>+</td>
<td>+</td>
<td>Indicator 10: State Government R&amp;D Expenditures</td>
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<td>-</td>
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<td>Indicator 12: Technology Transfer</td>
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<td>Indicator 13: Patents</td>
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<td>+</td>
<td>+</td>
<td>III. Kansas Competitiveness</td>
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<tr>
<td>-</td>
<td>-</td>
<td>Indicator 14: Business Climate</td>
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<td>-</td>
<td>Indicator 15: Venture Capital</td>
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<td>0</td>
<td>0</td>
<td>Indicator 16: Initial Public Offerings</td>
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<td>+</td>
<td>+</td>
<td>Indicator 17: Gazelle Firms</td>
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<td>-</td>
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<td>Indicator 19: ISO 9000 Compliant Firms</td>
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<td>Indicator 20: Value Added in Manufacturing</td>
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<td>-</td>
<td>Indicator 21: Exporting Firms</td>
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<td>-</td>
<td>+</td>
<td>Indicator 22: International Exports</td>
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<tr>
<td>++</td>
<td>++</td>
<td>IV. Kansas Human Resources and Infrastructure</td>
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<tr>
<td>+</td>
<td>+</td>
<td>Indicator 23: Workforce Education Level</td>
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<td>+</td>
<td>+</td>
<td>Indicator 24: High School Graduation Rates</td>
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<td>+</td>
<td>+</td>
<td>Indicator 25: SAT and ACT Scores</td>
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<td>+</td>
<td>+</td>
<td>Indicator 26: Math and Science Degrees</td>
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<td>+</td>
<td>+</td>
<td>Indicator 27: Engineering Degrees</td>
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<td>+</td>
<td>+</td>
<td>Indicator 28: Science and Engineering Graduate Students</td>
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<td>-</td>
<td>-</td>
<td>Indicator 29: Ph.D. Scientists and Engineers</td>
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<td>-</td>
<td>-</td>
<td>Indicator 30: Relative Funding of Kansas Instructional Faculty Salaries</td>
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<tr>
<td>-</td>
<td>-</td>
<td>Indicator 31: Internet Connectivity</td>
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<tr>
<td>+/-</td>
<td>+/-</td>
<td>Indicator 32: Computers and Internet in Elementary and Secondary Schools</td>
</tr>
<tr>
<td>+</td>
<td>+</td>
<td>Indicator 33: Telecommunications Infrastructure</td>
</tr>
<tr>
<td>0</td>
<td>+</td>
<td>+33a. Fiber Cable Intensity for Large Local Telecommunications Companies</td>
</tr>
<tr>
<td>0</td>
<td>+</td>
<td>+33b. Fiber in the Local Loop</td>
</tr>
<tr>
<td>-</td>
<td>0</td>
<td>+33c. ISDN Capacity of Large Local Telecommunications Companies</td>
</tr>
<tr>
<td>+</td>
<td>0</td>
<td>+33d. Digital Service Intensity</td>
</tr>
</tbody>
</table>

### Key

- **++** Major strength  
- **+** Strength  
- **0** Neutral  
- **-** Weakness  
- **—** Major weakness
The ultimate measure of success for a state economy is whether the economy provides opportunities for its residents: stability of employment, good jobs, and adequate household income. This section of the Kansas Innovation Index addresses how well Kansas provides opportunities, and the role technology plays in enhancing these opportunities.

A healthy economy is characterized by industrial diversity and income growth. When an economy is diversified across many goods and services, it can continue to provide employment and income opportunities while some of its sectors experience downturns. When an economy offers growing real wages, it is likely to be specializing in areas that stress high skills and education.

Economic activity in Kansas is organized around several key industry clusters that illustrate Kansas' diversity. Key industry clusters maintain one or more of the following characteristics:
- the industry or group of related industries employs a large number of people in the state;
- the industry or group has a high concentration in the state: that is, the industry comprises a greater share of the Kansas economy than it does of the U.S. economy;
- the industry is part of the state’s export base: that is, the industry serves regional, national, or international customers;
- the industry has a high potential for increasing the state’s export base.

*This report focuses on industry clusters linked to Kansas' strategic technologies.* Kansas is currently focusing its research and development efforts on several technology areas. Industries associated with these technologies are most likely to benefit from potential productivity enhancements. Also included in the key industry framework are sectors which add important diversity to the Kansas economy but are not directly linked to specific strategic technologies.

<table>
<thead>
<tr>
<th>Strategic Technology Area</th>
<th>Key Industry Clusters*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aviation technologies</td>
<td>Aircraft and aerospace</td>
</tr>
<tr>
<td>Materials technologies</td>
<td>Materials manufacturing (chemicals, rubber and plastic, metal products)</td>
</tr>
<tr>
<td>Advanced manufacturing technologies</td>
<td>Printing and publishing</td>
</tr>
<tr>
<td></td>
<td>Motor vehicles and parts</td>
</tr>
<tr>
<td></td>
<td>Industrial equipment excluding computers (engines, farm machinery, construction equipment)</td>
</tr>
<tr>
<td>Energy production technologies</td>
<td>Other smaller manufacturing industries are not included in the key industry analysis</td>
</tr>
<tr>
<td>Value-added agriculture technologies</td>
<td>Oil and gas (oil and gas production, petroleum refining)</td>
</tr>
<tr>
<td>Information and communications technologies</td>
<td>Value-added agriculture (meat products, grain products)</td>
</tr>
<tr>
<td>Bio-technology</td>
<td>Information and communications (telephone communications, communications hardware, computer software, computer services, computer hardware)</td>
</tr>
<tr>
<td>Not linked to strategic technologies</td>
<td>Bio-tech related industries (pharmaceuticals, biological products, medical equipment, commercial research and development)</td>
</tr>
</tbody>
</table>

*Note: See Appendix A for more detail on key industry clusters.*
The key sectors of the Kansas economy generally offer wages that exceed the state and national averages. Several of the sectors are also high growth areas.

The structure of the economy can also be analyzed in terms of its technology components. Nationally, technology-intensive industries have provided strong real wage growth, although wage growth has not always been accompanied by employment growth. Technology-intensive services, such as telecommunications and software development, have experienced both strong wage and employment growth at the national level.

Closely tied to issues of wages and employment are household income measures. Median household income indicates the level of income achieved by a household in the exact middle of the income distribution. Since price levels for goods and services vary on a state-by-state basis, direct comparisons of income (and for that matter, wages) across states can be somewhat misleading. While there are no perfect measures of state price levels, data for selected cities allow some overall price adjustment for comparison. The pattern of income distribution is also important. Is the distribution skewed heavily, with many very poor and many very rich households, or is the distribution more level? The more level the distribution, the greater the proportion of a state’s residents that share in the economy’s creation of income and wealth.
Indicator 1
Key Industry Clusters and Diversity

Aircraft, materials manufacturing, and value-added agriculture comprise largest key industry clusters

Indicator Significance

A strong state economy will specialize in sectors that provide opportunities for high wages and growth. The economy will be diverse, so that it can provide employment and income through economic downturns.

The diversity of an economy can be evaluated along three dimensions:

- *The absolute size of the industries.* If one or two industries dominate an economy, the economy may be subject to severe employment fluctuations.
- *The growth rates of the industries.* A healthy economy will include several fast-growing industry clusters.
- *The concentration of industries in the state.* An industry is said to be concentrated in a state if its share of the state economy is greater than the comparable industry’s share of the national economy.

For example, if an industry comprises 4 percent of a state’s economy but only 2 percent of the national economy, the industry is concentrated in the state, and its concentration ratio is measured at 2. A high concentration ratio indicates that competitive factors in the state have favored the industry historically.

Kansas Performance

The aircraft and aerospace industry comprises the largest key sector of the Kansas economy, employing over 42,000 people. This sector is followed by the materials manufacturing industry, employing over 32,000, and value-added agriculture, employing about 31,500. On the other end of the spectrum, bio-tech related industries employ only about 3,600 people.

The Kansas economy is diverse. Kansas supports a variety of industry clusters with over 25,000 employees. No single industry dominates the state’s economy. Many Kansas industry clusters

---

1a. Key Industry Clusters of the Kansas Economy, 1997

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft &amp; Aerospace</td>
<td>42,260</td>
</tr>
<tr>
<td>Materials</td>
<td>32,240</td>
</tr>
<tr>
<td>Value-added Agriculture</td>
<td>31,573</td>
</tr>
<tr>
<td>Inform. &amp; Comm. Technology</td>
<td>29,600</td>
</tr>
<tr>
<td>Printing &amp; Publishing</td>
<td>24,273</td>
</tr>
<tr>
<td>Engineer. &amp; Architect. Serv.</td>
<td>9,799</td>
</tr>
<tr>
<td>Motor Vehicles &amp; Parts</td>
<td>8,687</td>
</tr>
<tr>
<td>Energy: Oil &amp; Gas</td>
<td>8,304</td>
</tr>
<tr>
<td>Fire, Casualty &amp; Marine Ins.</td>
<td>5,928</td>
</tr>
<tr>
<td>Bio-tech</td>
<td>3,618</td>
</tr>
</tbody>
</table>

Source: Kansas Department of Human Resources.

“The Kansas economy is diverse. Kansas supports a variety of industry clusters with over 25,000 employees.”

Kansas Innovation Index
1b. Concentration and Growth in Kansas Key Industry Clusters

Source: Kansas Department of Human Resources and MIG, Inc.

exhibit moderate to rapid employment growth. Industries such as aircraft (concentration ratio = 7.0) and value-added agriculture (concentration ratio = 1.8) are highly concentrated in the state. This indicates that Kansas’ mixture of human and natural resources is highly attractive to these industries. Engineering and architectural services, motor vehicles, and information and communications have led growth in percentage terms. The bio-tech industry, which has been targeted for its global potential, is currently under-represented in the state. The industry has a concentration ratio of about 0.5, indicating that the industry is only half as big a share of the Kansas economy as it is of the U.S. economy. Employment is currently small, and employment growth has been negative.

“The bio-tech industry, which has been targeted for its global potential, is currently under-represented in the state.”
Indicator 2
Employment Growth in Key Industry Clusters

Information and communications technology cluster boosts Kansas employment by 6,000

Indicator Significance

The key sectors in Kansas have shown a variety of growth patterns over the period 1991-97. It is important to identify which sectors have grown the most in absolute terms, and which have grown fastest in percentage terms. Sectors that are both large and fast growing are the leaders of the Kansas economy.

Kansas Performance

Kansas’ highest growth employment cluster is one of the most critical industry clusters globally. During the period 1991-97, the information and communications cluster led growth in absolute terms, while the engineering and architectural services cluster led growth in percentage terms. Most of the remainder of Kansas’ key sectors experienced positive growth, totaling between 1,800 employees (aircraft) and 5,700 employees (information and communications). Aircraft, the largest of Kansas’ industry clusters, grew by a modest 4.4 percent over the 1991-97 period. Furthermore, employment in the aircraft industry has been subject to large swings. Employment in the energy, biotech, and insurance industries fell during the period 1991-97.

2. Employment Changes in Kansas Key Industry Clusters, 1991-97
(Change in Employees and Percent Change)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Change in Employees</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infor. &amp; Comm. Technol.</td>
<td>5,715</td>
<td>23.9%</td>
</tr>
<tr>
<td>Materials</td>
<td>5,671</td>
<td>21.3%</td>
</tr>
<tr>
<td>Value-added</td>
<td>4,601</td>
<td>17.1%</td>
</tr>
<tr>
<td>Agricult.</td>
<td>3,361</td>
<td>16.1%</td>
</tr>
<tr>
<td>Printing &amp; Publish.</td>
<td>3,278</td>
<td>16.2%</td>
</tr>
<tr>
<td>Engineer. &amp; Arch. Services</td>
<td>2,158</td>
<td>47.9%</td>
</tr>
<tr>
<td>Motor Vehicles &amp; Parts</td>
<td>-540</td>
<td>-33.1%</td>
</tr>
<tr>
<td>Aircraft &amp; Aerosp.</td>
<td>-1,800</td>
<td>4.4%</td>
</tr>
<tr>
<td>Fire, Casualty &amp; Marine Ins.</td>
<td>-573</td>
<td>-8.4%</td>
</tr>
<tr>
<td>Bio-tech</td>
<td>-573</td>
<td>-13.7%</td>
</tr>
<tr>
<td>Energy: Oil &amp; Gas</td>
<td>-1,817</td>
<td>-18%</td>
</tr>
</tbody>
</table>

Source: Kansas Department of Human Resources.

"Kansas’ highest growth employment cluster is one of the most critical industry clusters globally."
Indicator 3
Wages and Wage Growth

**Insurance, aircraft, and information industries provide highest wage jobs and lead real wage growth**

**Indicator Significance**
States increasingly see quality jobs as the focus of their development efforts. Quality jobs exhibit a high wage level and a high real wage (inflation adjusted) growth rate.

**Kansas Performance**
Annual wages paid in the Kansas key technology industry clusters exceed those paid in the Kansas economy and the U.S. as a whole. Nevertheless, the overall level of Kansas wages is substantially below the U.S. average. In order for Kansas’ private sector wages to grow, it must accelerate growth in the key technology industry sectors.

In most key industry clusters, real wage growth has been positive and far in excess of the Kansas average. Industries such as insurance, motor vehicles, aircraft, and information and communications have combined high wages with high real wage growth during the period 1991-97.

* Note: Data through 1997 were available for Kansas, but not for the nation.

"Annual wages paid in the Kansas key technology industry clusters exceed those paid in the Kansas economy and the U.S. as a whole."
Indicator 4
Real Wage and Employment Growth in High-Tech Industries

High-tech services excel at employment growth and real wage growth

Indicator Significance
Nationally, real wage growth (per employee) averaged about 0.6 percent per year over the period 1991-96. Wage growth in high-tech industries was much more rapid: 1.9 percent in high-tech services and 1.5 percent in high-tech manufacturing and mining. Employment growth for the nation as a whole averaged about 2.2 percent during 1991-96. National employment growth in high-tech services far exceeded this figure. On the other hand, employment growth for high-tech manufacturing and mining was negative.

Kansas Performance
In Kansas, overall real wage growth averaged about 0.6 percent per year over the period 1991-96, and 0.8 percent for the longer period 1991-97.* In high-tech services, real wage growth was about 1.0 percent per year for 1991-96 and 1.7 percent per year for 1991-97. Real wage growth in high-tech services has been slightly slower than the national average. Kansas real wage growth in high-tech manufacturing and mining industries averaged 2.7 percent annually during 1991-96 and 2.3 percent over the period 1991-97. Real wage growth in these industries has been better than the national average.

Employment growth in high-tech industries presents a mixed story. Nationally, high-tech manufacturing and mining lost employment during the period 1991-96. Kansas businesses lost employment at a rate slightly worse than the national average during 1991-96. A resurgence of the aircraft industry in Kansas in 1997 raised the six-year average (1991-97) to 0.8 percent, reversing a previous manufacturing decline.

Kansas employment growth in high-tech services has been rapid—4.4 percent per year over 1991-97. There is a real opportunity for Kansas to build upon its strength in high-tech services to enhance employment and wage growth.

* Note: Data through 1997 were available for Kansas, but not for the nation.

4. Average Annual Real Wage and Employment Growth in High-Tech Industries

Source: MIG, Inc. and Kansas Department of Human Resources.

"Kansas employment growth in high-tech services has been rapid—4.4 percent per year over 1991-97."
Indicator 5
Employment in High-Tech Industries

Aircraft and parts, telephone communications, and engineering and architectural services lead high-tech employment in Kansas

Indicator Significance

High-tech industries are characterized by their investment in research and development and by their employment of highly skilled and educated workers. Despite agreement about the general concept of high-tech, analysts disagree over the specific industries to be included. This report combines lists from the an article by Luker and Lyons (1997) and from the American Electronics Association, although the lists overlap considerably.*

It is important to identify the entire range of high-tech businesses in a state because they usually offer high-wage jobs and could become the key industry clusters of tomorrow.

Kansas Performance

Only a few of the Kansas key industries (aircraft, engineering services, and information and communications) can be considered as high-tech industries on the whole. Other key clusters include high-tech components along with sub-industries that are less R&D intensive.

Kansas supports twenty specific high-tech industries employing at least 1,200 people. Most of Kansas’ high-tech industries are sub-components of key industry clusters. Aircraft and parts (42,300 employees), telephone communications (13,900 employees), and engineering and architectural services (9,800 employees) lead high-tech employment in Kansas.

*Note: See Appendix B for list of high-tech sub-components of key industry clusters.

“Kansas supports twenty specific high-tech industries employing at least 1,200 people.”
Indicator 6
High-Tech Wages and Employment

High-tech industries generate almost 20 percent of Kansas wages and almost 12 percent of Kansas employment

Indicator Significance
High-tech industries tend to cluster together geographically. The size of a state's technology base provides a starting point for future growth.

Kansas Performance
High-tech industries in Kansas generate 19.7 percent of wages and salaries, and 11.6 percent of employment. This places Kansas second in the region (after Colorado) in terms of the relative size of its technology base. High-tech industries comprise a larger share of the Kansas economy than the nation as a whole, based primarily on the strength of the aircraft and communications industries. Overall, Kansas has a strong technology base on which to build.

"High-tech industries comprise a larger share of the Kansas economy than they do of the nation as a whole."
Indicator 7
Average Annual Wage

Kansas wages per job rank third in the region, but remain well below national levels

Indicator Significance

The average annual pay per job indicates the return to labor in an economy. The wage level is a key determinant of the economic well-being of a state’s residents. Wage levels reflect factors such as the skills of the workforce, the skill requirements of employers, and market conditions such as low unemployment.

To be an accurate gauge of consumer welfare, average annual wages should be adjusted for relative prices. It is well known that prices of housing, food, medical care, and other goods and services vary widely across states and regions. There exists no perfect data comparing state-level prices. However, the American Chamber of Commerce Researchers Association (ACCRA) performs a quarterly survey of prices in about 300 U.S. cities. The ACCRA dataset can be used to make rough price comparisons.

Kansas Performance

In 1996, average annual pay in Kansas stood at about $24,600. In 1996, prices in Kansas averaged 96.2 percent of the national average. When the wage figure is adjusted for price differences, it is the equivalent of about $25,600. Kansas placed third within the seven states in the region, both in unadjusted and price-adjusted measures. Only Colorado and Missouri ranked higher. After adjustments for price differences, Kansas wage levels remained well below the national average. In fact, Kansas and the entire region rank below the national average for both adjusted and unadjusted wages.

"...Kansas and the entire region rank below the national average for both adjusted and unadjusted wages."
**Indicator 8**

**Median Household Income and Income Distribution**

*Kansas income distribution is becoming less equitable and is among the least equitable in the region*

**Indicator Significance**

Median household income provides an additional indicator of the economic well-being of a state’s residents. The median income concept is much broader than just wages (Indicator 7). It includes profits, interest, dividends, retirement benefits, self-employment earnings, and all other income received by all members of a household. The median income is defined as the income at the exact center of a state’s income distribution. In other words, half of the households in a state have a larger income than the median, and half have a smaller income. To make comparisons of median income across states, it is necessary to adjust for differences in state price levels.

It is also important to examine the pattern of income distribution. Does a state have many very poor and many very rich households, or is income distributed more evenly? There are many alternative measures of income distribution. The ratio of the 20th percentile to the 80th percentile of income used in this report compares a low-income household with an upper middle class household. In 1996, the U.S. 20th percentile of income stood at $14,768 and the 80th percentile stood at $68,150. Changes in the income ratio over time show whether low-income households have been sharing in the benefits of growth.

**Kansas Performance**

The median Kansas household received an annual income level of $34,900 over the 1996-97 time period. When adjusted for differences between Kansas prices and national prices, this is the equivalent of $36,300 per household, very close to the national average. The median income level in Colorado stands out within the region at

"...Kansas ranks fourth of the seven states in the region in median income."
$41,200 (price adjusted). After adjusting for state price levels, Kansas ranks fourth of the seven states in the region in median income.

Income distribution is slightly less equitable in Kansas than in the nation as a whole. In Kansas, a low-income household (a household at the 20th percentile) receives 21 percent of the income of a household at the 80th percentile. Nationally, the ratio is 22 percent. Kansas ties Oklahoma for last place in the region on this equity measure.

During the 1990s, income inequality in Kansas has worsened. In 1991, a household at the 20th percentile of income earned 25 percent of a household at the 80th percentile. The ratio declined steadily to its current level of 21 percent. Over the same time period, the national ratio remained fairly constant (22 percent).

"During the 1990s, income inequality in Kansas has worsened."
Innovation . . . the introduction of new things or methods . . . something that differs from existing forms . . .

What does it take to introduce an innovative new product or process to the marketplace? An early-to-mid 20th century economist, J.A. Schumpeter, analyzed three aspects of the technology life cycle—invention, innovation, and diffusion. At the invention stage, someone must imagine a new product, process, or service. For it to become an innovation, the invention must have a purpose. Innovation can be defined as invention made practical. A successful innovation must be technically feasible, and moreover, offer customers value over existing alternatives. When a successful innovation enters the marketplace, the process of diffusion begins. The innovation may be licensed from its inventors, “imitator” products and processes may develop, and the product or process may have applications far beyond those envisioned by its earliest inventors.

Research and development (R&D) funding is an essential nutrient for any technology life cycle. A new product or process needs R&D funds at three critical stages: during the initial invention stages, while the innovation is readied for the market, and while adaptations are made in response to consumer feedback. Sometimes R&D funds enable basic research concepts to be integrated into new applications. Many sectors of the economy—industry, the federal government, state governments, and universities—perform R&D activities. At the same time, a multitude of sources fund R&D, the most important public source being federal government agencies.

To begin, this section looks at R&D funding and identifies its sources within Kansas and the surrounding states. Indicators of R&D activity include industry R&D spending, university R&D spending, state government research dollars, and dollars awarded to small businesses in the form of SBIR and STTR grants.

As inventions emerge from the laboratory into the marketplace, inventors and investors need appropriate methods to protect their intellectual property. Patenting is one mechanism (although not the only mechanism) to protect intellectual property. In the private sector, patents allow a firm owner to use an innovation in his/her own products and services, or to sell the rights to others. Small firms with promising portfolios of patents can also attract investment to further the marketing process. In the public sector, licensing is the most common way in which inventions and innovations move from university laboratories into the marketplace. These processes are called “technology transfer.”

Overall, research and development, patents, and licenses form the early stages of the technology life cycle. A state that leads in getting technology into the marketplace will very likely lead in reaping the later stage economic benefits of successful new products and services.

*Note: A summary of the economic theory of innovation is found in Eatwell, Milgate, and Newman, 1987 (see Appendix A).
Indicator 9
R&D Spending by Universities and Industry

Kansas trails nation in R&D spending by industry and universities

Indicator Significance

Spending on research and development (R&D) is a key component of economic development, and is the driving force behind innovation in the marketplace. R&D spending underpins the commercialization of new products and processes as well as improvements in existing products and processes.

R&D is performed primarily by industry (73 percent of all R&D) and universities (15 percent). The federal government provides approximately 60 percent of all academic R&D funding, and universities rely heavily on federal support for their R&D efforts.

Kansas Performance

Kansas is below the national average on per capita R&D spending by industry and ranks fourth in the region behind Colorado, Missouri and Iowa. In 1995, Kansas ranked 32nd in the U.S. on R&D spending by industry, with $221 per capita in comparison to the national average of $503. This may reflect the relative lack of corporate headquarters and R&D operations in the state. However, this measure may also indicate that Kansas businesses trail in R&D spending. In this region, only Colorado’s industry exceeded the national average for R&D spending.

R&D spending by Kansas universities also trails the national average. Kansas universities spent $71 per capita, which was about 15 percent below the national average of $84. However, Kansas universities trail seriously in federally funded R&D, obtaining only $27 per capita in 1995, which was about one-half of the national average of $51. The state’s universities are not yet competitive in obtaining federal R&D support.

Source: National Science Foundation.
Indicator 10
State Government R&D Expenditures

*Kansas leads nation in state government R&D expenditures*

Indicator Significance

State government research and development expenditures per capita measure a state’s commitment to support basic research and commercialization efforts within that state. Such research drives the development of new products and processes as well as improvements in existing products/processes. With technology changing at a very rapid rate, ongoing R&D is critical for the competitiveness of a state’s industries. State support of research is particularly important for small states that do not have any federal research laboratories and that do not have many large company corporate headquarters with accompanying R&D activities.

Kansas Performance

Kansas ranks first in the nation in per capita state government R&D expenditures.* In 1995, Kansas spent $32.73 per capita in contrast to the national average of $11.48. In this region, Kansas ranked first followed by Nebraska, which had per capita R&D state spending of $28.45. Arkansas ranked 46th in the nation with spending of $1.22. Kansas ranks 10th in overall (not per capita) state government R&D expenditures.

*Kansas’ state government R&D expenditures are well distributed across functional areas.* The largest support is for the state’s science and technology base, which received 44.1 percent of state R&D expenditures. The science and technology base includes applied and basic research that may have applications in more than one functional area. Agriculture received 10.7 percent of state R&D expenditures.

*Note: Possible variations in tracking and reporting of expenditures by individual states may have affected the results of this measure.*
Indicator 11
SBIR and STTR Awards

Kansas falls behind in SBIR and STTR funding

Indicator Significance

The Small Business Innovation Research Program (SBIR) provides federal research and development (R&D) funds to small businesses. SBIR funds the critical start-up and development stages and it encourages the commercialization of new technologies, products, or services. Under the Small Business Technology Transfer Program (STTR), funding is targeted for partnerships between small businesses and non-profit research institutions, including universities.

Per capita funding for SBIR and STTR indicates how competitive a state’s small businesses are in developing and commercializing innovative technology and products. In addition, STTR funding indicates how well a state’s universities are working with small businesses on R&D efforts.

Kansas Performance

Kansas falls far behind the U.S. average on per capita funding from the SBIR and STTR programs. Kansas per capita funding from SBIR/STTR in 1997 was $0.46 in comparison to the national average of $4.46. Within the region, only Colorado exceeded the national average; it had per capita funding of $11.84 in 1997. In recent years, Kansas has received between 10 and 13 grants annually. In 1997, 11 SBIR awards and two STTR awards went to Kansas firms. Kansas small businesses must be willing to compete for federal R&D funds.

Kansas’ performance on this indicator indicates a weakness in the R&D efforts of the state’s small businesses. The state must at least match the U.S. average on this indicator. In Kansas, the funding for STTR also indicates that the state’s universities are not yet establishing sufficient partnerships with small businesses for research projects with commercial possibilities.
Indicator 12
Technology Transfer

Kansas' major research institutions lag nation in intellectual property and licensing

Indicator Significance

Technology transfer is the process whereby intellectual property derived from academic research is licensed or conveyed to industry. From this research inventive results are formalized by disclosure or the legal process, through patents or some other form of statutory protection. With commercial interest, these inventive results are "transferred" to industry through licensing.

The vitality of the technology transfer process can be measured by several indicators. Invention disclosures and patent applications are indicators of the number of inventions and intellectual properties created through academic research. License options executed and license income are indicators of the value of these intellectual properties.

Kansas Performance

According to a recent survey of major research institutions, Kansas ranks fourth among the surrounding states in invention disclosures and patent applications per million population. Kansas universities and research hospitals made 21.3 invention disclosures and 7.8 new patent applications per million population in 1996 or 55 invention disclosures and 20 new patent applications total. Kansas universities are well below the national average of 33.9 invention disclosures and 11.6 new patent applications per million population.

License options are fees paid to inventors for the right to license a particular intellectual property. License options executed indicates the number of commercially valuable inventions produced by major research institutions. Kansas ranks fourth among surrounding states with 7.0 license options executed per million population in 1996 or 18 total. Iowa leads with 45.3 per million population or 129 total. The national average is 9.4 per million population.


Source: Association of University Technology Managers, Inc.

"Kansas universities are well below the national average of 33.9 invention disclosures and 11.6 new patent applications per million population."
Kansas ranks fifth among surrounding states in per capita licensing income received by universities and research hospitals. Kansas universities and research hospitals received only $0.25 per capita in licensing income in 1996 or $650,000 total. Iowa universities and research hospitals led with $1.47 in licensing income per capita or $4.2 million total. Kansas is well below the U.S. average of $0.51 per capita.

"Kansas universities and research hospitals received only $0.25 per capita in licensing income in 1996."
Indicator 13
Patents

Kansas patents inventions at half the national per capita rate

Indicator Significance

The federal government issues patents to inventors, granting a legally enforceable right to exclude others from using their inventions. Patents are generally the end product of research and development by organizations and individuals in the public and private sectors. Patenting is only one method of protecting intellectual property; other methods include trade secrets and copyrights.

There are differences across industries in how effectively patents appropriate returns to their owners. Pharmaceutical and chemical patents are among the most effective product patents, while patents on mechanical equipment are "moderately effective" in appropriating returns to patentees.* In industries in which patents have proved effective, patents are more common. Thus, in part, state differences in patenting activity reflect the underlying industry structure.

Nevertheless, the number of patents granted to organizations and individuals in a state serves as an indicator of innovation. Since a small firm with a "portfolio" of patents can attract more investors, it also indicates business competitiveness.

Kansas Performance

Between 1986 and 1996, patenting activity in Kansas rose by over 60 percent, to 291 patents. This reflected the U.S. trend toward increased patent activity. Kansas ranked well below the U.S. average of 23 patents per 100,000 population. Kansas ranked fifth out of seven surrounding states with 11 patents per 100,000 population in 1996. Colorado led this category with 31 patents per 100,000 population.

*Levin, Richard C., et al. (see Appendix A).
The distribution of Kansas patents is fairly broad, with patents for mechanical equipment being the best represented. Over the period 1992-96, non-electrical machinery and farm machinery, which are part of the industrial machinery cluster, together accounted for 31.9 percent of Kansas patents. Chemicals and allied products, which includes pharmaceuticals, accounted for 8.8 percent. Surprisingly, the aircraft industry did not account for many Kansas patents—a total of only five in 1996.

**13c. Distribution of Kansas Patents, 1992-96**

- Professional & Scientific Instruments: 15.0%
- Fabricated Metal Products: 9.0%
- Chemicals & Allied Prod.: 8.8%
- Commun. Equip. & Electronic Components: 6.3%
- Farm & Garden Mach. & Equip.: 6.6%
- Electrical Mach. Equipment: 4.8%
- Non-electrical Machinery: 25.3%
- Other: 24.3%

Source: U.S. Patent and Trademark Office.

"...the number of patents granted to organizations and individuals in a state serves as an indicator of innovation."
To continue the creation of jobs and income, Kansas firms must be capable of competing in the economy of the next century. But what does “compete” mean?

Most importantly, competition means that firm owners must perceive Kansas as a good place to live and to do business. Of all the ingredients of a successful business, the entrepreneurial skills of the owners are perhaps the most essential. Kansas must keep its “home grown” entrepreneurs and attract new businesses to the state. The business climate indicator in this section addresses the satisfaction of firm owners with the state’s business environment.

Competition also means that Kansas is capable of generating new businesses and of growing them into successful firms. This section looks at two indicators of firm growth: data on start-ups show the extent of new firm creation, while data on “gazelles” show how many firms are expanding at a rapid rate.

Kansas firms must be successful at competing for financing in order for rapid growth to occur. This section looks at two stages of financing: venture capital and initial public stock offerings. In order to acquire financing at the venture capital stage, firm owners must offer attractive prospects to investors. Investors, who tend to be concentrated on the coasts, need to learn about Kansas opportunities. For Kansas firms to “go public,” they must achieve a critical mass of customers and sales revenue.

Quality will be a key component of future competitiveness. Kansas firms must compete on the quality of their goods and services. ISO 9000 compliance assures purchasers elsewhere in the nation and the world that a Kansas firm has excellent quality control mechanisms in place.

Finally, Kansas must be capable of competing in the international marketplace. Indicators on the number of exporting firms and on the total dollar volume of exports gauge how well Kansas competes in international commerce.
Indicator 14
Business Climate

Business leaders view Kansas’ business climate favorably

Indicator Significance

The business climate indicator measures how business leaders perceive a state as a place to conduct business. These perceptions are significant as they suggest areas for improvement as well as areas of satisfactory performance. Businesses have options on where to expand operations or locate new operations and usually favor states with a positive business climate.

Kansas Performance

A 1996 Kansas survey shows leaders have an overall positive perception of the state’s business climate. On most measures, a substantial majority of respondents reported Kansas as having a strength rather than a weakness. In particular, the quality of life was seen as a strength by 90 percent of business leaders and as a weakness by only 6 percent. This means that business leaders find Kansas to be a good place to live and are not anxious to leave for lifestyle reasons.

Other business climate factors are generally positive, although a significant minority identifies a weakness in each one. Thus, 68 percent perceive the labor force to be a strength while 21 percent see this as a weakness. Similarly, 52 percent see the availability of financial capital as a strength, but 21 percent see this as a weakness. There is considerable room for improvement in such measures. Significantly, 16 percent perceive the availability of technology as a weakness.

A relatively high percentage of business leaders—30 percent—see cultural activities as a weakness. This is of particular concern as business leaders and their families likely place a high value on cultural activities.

*Note: Data on the Kansas business climate are available for 1996 only. Time series data on this indicator are needed in order to identify trends.
Indicator 15
Venture Capital

Venture capital funding in Kansas is one-third the national per capita average

Indicator Significance

Venture capital is essential for new business start-ups. A state with access to venture capital is more successful in fostering the creation and growth of start-up firms in technology-based areas. A lack of venture capital indicates a weakness in a state's prospects for future growth in emerging technologies. Also, entrepreneurs also may choose to locate in an area with greater prospects for obtaining access to venture capital.

While every new start-up will not require all forms of venture capital, entrepreneurs may need:
- *seed/start-up capital* - the firm is proving the concept (seed), completing initial product R&D, building a prototype, completing market research, and hiring initial management and employees;
- *early stage capital* - the period when the new firm has high growth potential but minimal product revenue and often an incomplete management team;
- *second stage capital* - the firm has started producing, has growing sales, and needs funding for expansion;
- *late stage capital* - the firm is continuing to grow, may be showing a profit, and needs additional funds for improvement and expansion.

Sources of venture capital include individual investors, institutional investors, and venture capital firms. This indicator measures the amount of venture capital invested in a state from venture capital firms.

Kansas Performance

For 1997 and the first two quarters of 1998, Kansas had $23 per capita in venture capital funding. This was one-third of the national average of $68. During this period, there were 10 venture capital investments in Kansas for a total of $59,701,000. Kansas ranked third in the region behind Colorado and Missouri.

"... Kansas had $23 per capita in venture capital funding... only one-third the national average of $68."
Notably, Kansas did not have any seed/start-up/early stage venture capital for 1997-98. These earliest stages of venture capital are important for moving ideas from a research lab to commercialization. If the absence of venture capital funding of start-up firms continues, it would indicate a serious gap in Kansas support for new firms with high growth potential.

This indicator suggests that Kansas is not starting and growing a sufficient number of new businesses using venture capital. Either too few entrepreneurs are starting new firms requiring venture capital or inadequate access to venture capital resources exists.

“**If the absence of venture capital funding of start-up firms continues, it would indicate a serious gap in Kansas support for new firms with high growth potential.”**
Indicator 16
Initial Public Offerings

Colorado, nation outpace Kansas in per capita IPO activities

Indicator Significance

Firms often encounter difficulties raising the capital they need to expand. This is especially true for small to medium-sized young firms. An initial public offering is an opportunity for initial investors to realize a return on their investments and for the company to raise substantial growth capital without incurring additional debt. The firm must file detailed information with the Securities and Exchange Commission (SEC) to sell stock. The initial public offering (IPO) is the first time the firm offers stock to the public. Although some large, well-known privately held firms decide to go public, most IPOs are for small to medium-sized businesses. With a successful IPO, the firm attains the funds needed to grow the business. A successful IPO indicates that investors foresee future profits for the firm.

Kansas Performance

During the period 1996-98,* nine Kansas firms filed with the SEC to go public. Two of these firms were in high-technology industries, while the remainder included restaurants, hotels, and financial service firms. Over the same time period, 1,416 firms filed for IPOs nationwide, of which about 46 percent operated in high-tech industries.**

Colorado led the region in IPO activity over the last two and a half years, with 45 IPOs, or 11.6 per one million population. Kansas fell far short of Colorado’s achievement, with only 30 percent as much activity: 3.5 IPOs per million people. Kansas also fell short of the national average of 5.3 IPOs per million.

*Note: Data on IPOs were available in electronic format from Hoover’s Online for the time period May, 1996-Sept. 1998 (see Appendix A).

**Note: See Appendix B for definition of high-tech for this indicator.

Source: Hoover’s Online and U.S. Bureau of the Census.
Indicator 17
Gazelle Firms

High-growth gazelle firms are abundant in Kansas, especially in manufacturing

Indicator Significance

“Gazelle” describes the behavior of firms that “bound ahead” in sales growth. Gazelles are identified as firms growing at least 20 percent per year over a four-year period, with an initial sales base of at least $100,000. Nationwide, these firms generate more than 70 percent of all new jobs.*

Gazelles are found in every sector of the economy. However, they are over-represented in manufacturing. Manufacturing firms comprise 8.7 percent of gazelle firms. In contrast, manufacturing firms comprise only 5.7 percent of total firms. Nationwide, over 95 percent of gazelle firms have employment of less than 100. However, gazelles also exist among larger firms, and in particular, among publicly traded firms.

Kansas Performance

Currently, 8.8 percent of Kansas manufacturing firms, and 4.3 percent of Kansas firms overall, can be classified as gazelles. This compares favorably with the U.S. average and with neighboring states. Within the region, only Missouri shows a higher percentage of high growth firms.

Within the narrower universe of publicly traded firms, gazelles are much more common. Of about 6,500 publicly traded firms in the U.S. for which sales data were available for 1993-97, 27 percent had an annual growth in the gazelle range. Of firms with their major business location in Kansas, the proportion was somewhat smaller, 21 percent. However, the number of publicly traded firms in Kansas is very small, so the addition of one or two gazelles could make a big change in percentages.

Many publicly traded firms operate within Kansas even though Kansas is not their chief business location. To track the dynamics of such firms, the Kansas Technology Enterprise Corporation has designed the Kansas Technology Index, a list of technology-intensive firms central to the Kansas economy. Of the 32 firms in the index for which data were available, only four met the gazelle standard of growth.

*David Birch, Anne Haggerty, and William Parsons, Corporate Almanac (see Appendix A).
Indicator 18
Start-Ups and Firm Creation

Kansas ranks below the national average in start-up formation and in net firm growth

Indicator Significance

A vigorous economy creates opportunities for entrepreneurs to start new businesses. The rate of start-ups indicates the optimism of the state’s residents about business success, and their access to financial resources and to information about how to get a business off the ground. Start-ups are measured as the number of firms with at least one employee that begin business for the first time during the year.

At the same time as start-up firms are being created, existing firms die or are reorganized. According to the U.S. Small Business Administration, about half of the firms in existence today will not exist five years from now.*

Net firm creation is the overall change in the number of firms in business from year to year. It takes into account start-ups, firm deaths, and firm reorganizations. A healthy economy may experience a fairly high rate of births and deaths, but the overall rate of firm growth should be positive.

Kansas Performance

The rate of start-up formation and the net growth in number of firms in Kansas were below the national average in 1996. Kansas added start-up firms at a rate of 10.6 percent, compared with a national rate of 13.8 percent. This placed Kansas 44th in the nation in start-up formation. Taking firm births and deaths into account, the net number of firms in Kansas increased by 1.1 percent in 1996. Kansas placed 35th in the nation on this indicator. Kansas’ rankings indicate a lower than average amount of entrepreneurial activity in the state.

*The State of Small Business, 1995, p. 34
(see Appendix A).
Indicator 19
ISO 9000 Compliant Firms

Kansas trails region and nation in ISO 9000 registrations

Indicator Significance

ISO 9000 is a series of quality systems standards and associated guidance materials first published in 1987 by the International Organization for Standardization. ISO 9000 standards refer primarily to a firm’s processes. This ensures the firm has a quality management system so that the product meets the customer’s requirements.

ISO 9000 standards are recognized and accepted worldwide. Gaining a competitive advantage, setting objective targets for quality, and satisfying the quality assurance demands of global customers are reasons certification of ISO 9000 compliance is important to a firm. ISO 9000 is much more popular in Europe and other parts of the world than it is in the U.S. However, the trend is changing as an increasing number of companies realize the importance of this certification.

Kansas Performance

As of 1998, 134 firms doing business in Kansas were registered as ISO 9000 compliant. Nationwide, there were 23,353 such firms.

There are two options for turning the raw data on the number of firms into an indicator for interstate comparisons. One approach is to compare the number of ISO compliant firms with the total number of manufacturers in the state; about 90 percent of current registrations are manufacturing firms. Another option is to compare the number of ISO compliant firms with the number of businesses that might potentially seek registration—manufacturers, software firms, communications firms, and other business service providers.

In Kansas, the ratio of firms registered as ISO 9000 compliant to the total number of manufacturers is about 4 percent. This places Kansas well below the national average of 5.8 percent, and in the lower tier of states in the region. A comparison of ISO 9000 firms to the sum of businesses in manufacturing, communications, software, and business services yields a similar result. Lack of ISO 9000 registration could hinder the ability of Kansas firms to compete nationally and globally.

"Lack of ISO 9000 registration could hinder the ability of Kansas firms to compete nationally and globally."

Source: Mid America Manufacturing Technology Center.
Indicator 20
Value Added in Manufacturing

Manufacturing employee productivity is declining

Indicator Significance
Value added per manufacturing employee measures the productivity of labor and capital in a state. It is defined as the dollar value of manufacturing output minus the value of materials and other intermediate inputs.

High values on this indicator suggest that the state’s labor is highly productive; the workforce is well educated and skilled or they have more capital with which to work. The indicator is significant because high employee productivity is needed to support high wages and personal income. Only states with above average labor productivity are likely to be above average in manufacturing wages.

Kansas Performance
Value added per manufacturing employee in Kansas in 1996 was $89,960, which was slightly below the U.S. average of $93,776. On this indicator, Kansas performs worse than most states in this region, including Colorado, Missouri, Iowa and Oklahoma. Either Kansas has less productive workers, or its manufacturing firms are less capital intensive than those of most states, both regionally and nationally. Encouraging Kansas manufacturing firms to invest more capital is one possible response to the state’s below average ranking. However, growing employment in meatpacking may be pulling down the average. Another option is to encourage capital intensive firms to invest in the state.

Since 1992 in Kansas, manufacturing employee productivity in Kansas has been declining. From 1992-96, value added per employee fell by 1.31 percent annually on an inflation adjusted basis. Over the same period, the U.S. saw an average increase of 0.82 percent. Gains in real wages in Kansas manufacturing are likely to lag behind the national trend, unless there is a shift to high value-added technology industries. Of the other states in the region, only Oklahoma and Nebraska had declines in labor productivity for this period.

20. Value Added per Manufacturing Employee, 1996, and Real Growth Rate, 1992-96


"Either Kansas has less productive workers, or its manufacturing firms are less capital intensive than those of most states, both regionally and nationally."
Indicator 21
Exporting Firms

Small businesses are under-represented in the Kansas export mix

Indicator Significance

Only a small percentage of U.S. firms engage in international trade. Nevertheless, small businesses with under 500 employees are very active in this group. In 1992, the most recent year for which data are available, small firms accounted for about 30 percent of the value of U.S. international exports. Exports offer tremendous potential (and also high risk) for firms that can satisfy the demands of international markets.

Successful exporters are competitive in quality and price—they understand the needs of consumers outside the local market, and they have acquired knowledge on how to export. The percentage of exporting firms in a state indicates the extent to which firms are able to exploit export markets.

Kansas Performance

As of 1992, only 2.2 percent of firms in Kansas exported, a total of about 1,300 firms. This placed Kansas 35th in the nation, and third in the region. In contrast, over 4 percent of firms in states such as California, Florida, and Massachusetts exported. The weighted average for all 50 states was 3.1 percent.*

As of 1992, small firms were under-represented in the Kansas export mix with about 75 percent of exporters in the small business category. The average for all states was 83.8 percent. Within the region, only Colorado ranked among the top half of states on small business participation. The numbers suggest small businesses need assistance with exports.

*Note: See Appendix A for an explanation of how the U.S. average was calculated.
Indicator 22
International Exports

Kansas exports per capita are rising rapidly, but trail the national average

Indicator Significance

Increasingly, the U.S. economy is a global economy. Over the period 1993-97, U.S. international exports of merchandise expanded by 48 percent. During the same period, gross domestic product (GDP) grew by only 24 percent, and total earnings (wages and other labor income) grew by 25 percent. Clearly, exports are an engine for growth for the national economy. Exports have the same potential for a state’s economy.

For a firm to export successfully, it must produce goods globally competitive in terms of price and quality. Export success signals the ability of a state’s businesses to create products in world-wide demand. At the state level, international export earnings bring new dollars and support jobs and income.

Kansas Performance

Kansas ranks second in the region after Colorado in per capita merchandise exports. Kansas exports close to $2,000 per capita, placing it 18th among the states. While Kansas per capita exports are high for the region, they are only 80 percent of the national average.

Rapidly growing exports are a strength of the Kansas economy: 65 percent growth during the period 1993-97 compared with 48 percent growth nationally. Furthermore, exports are growing faster than the Kansas economy in general. Earnings in Kansas, a proxy measure for general economic growth, rose only 27 percent during the same period.

"Rapidly growing exports are a strength of the Kansas economy: 65 percent growth during the period 1993-97 compared with 48 percent growth nationally.”
Kansas' exports are tied closely to its key industry clusters. Manufactured products comprise about three-fourths of Kansas' exports, while agricultural commodities comprise most of the remainder. The transportation equipment industry (aircraft and automobiles) accounts for about one-fourth of exports. Raw agricultural exports provide 23 percent of exports, and another 18 percent originate in value-added agricultural processing.

Data on state exports of services are tabulated every five years and are not included in the graphs in this section. The most recent data, from 1992, show Kansas service exports of about $112 million, or about $45 per capita.

"Manufactured products comprise about three-fourths of Kansas' exports, while agricultural commodities comprise most of the remainder."


Ideas are the seed of innovation. Without them, creativity stagnates and growth is impossible. People generate ideas and rely on the technology infrastructure to enable a smoother innovation process. In this section, we focus our attention on the human capital and infrastructure aspects of innovation.

Beginning with education, the fundamental element of human capital, we see the importance of investing in human resources. One measure of the quality of a workforce is its education level. *Those with the highest levels of education are responsible for a larger quantity of a firm's idea generation.* To attract and retain high technology firms, a state must supply these "knowledge workers."

Since the minimum requirement for most quality jobs is a high school diploma, the high school completion rate is a key indicator. However, technology firms want a college-educated workforce for their high-wage positions. A state with strong potential for supplying these workers has a large number of students taking and scoring well on college entrance exams such as the SAT and ACT. Students’ performances on these exams also verify the strength of the state’s school system and its commitment to providing quality education for its children.

Preparing students for careers in math, science, and engineering must be a priority in elementary and secondary schools as well as in postsecondary and graduate institutions. Scientists and engineers with bachelor, graduate, and doctorate degrees are all important to the technology mix. States that prepare quality scientists and engineers will have a competitive advantage. To educate these top quality scientists and engineers, research institutions must attract and retain the best teachers/researchers. One important ingredient to this mix is offering competitive salaries.

Not only is the human infrastructure important, but also the physical infrastructure that supports education and workplace productivity. Internet connectivity is one important component to both business and education. Business relies on it as a way of doing business through electronic commerce and communication. Education requires it as a tool for accessing current information and as a window into other worlds and cultures. However, for the tool to be useful, schools must have adequate up-to-date computer equipment to take full advantage of the Internet’s capabilities. Telecommunications, the backbone of this infrastructure, must continue to improve capacity and remain state-of-the-art for a state to remain competitive in the 21st century.
Indicator 23
Workforce Education Level

Kansas leads region in workforce education level

Indicator Significance

Employers considering Kansas as a business location use education level as an indicator of the state’s workforce quality. This is one important way in which a state can distinguish itself from otherwise similar states.

Kansas Performance

Kansas continues to raise the bar for workforce quality in the region. Kansas has shown a steady increase in the number of persons with at least a bachelor’s degree, up from 26 percent in 1995 to 28 percent in 1997. Comparably, the region remained steady at 22 percent, and the national rates rose slightly from 23 percent to 24 percent for the same period. At the same time, the number of persons without a high school diploma decreased from 14 percent in 1995 to just 12 percent in 1997. The region has seen a slight increase in the number of persons without a high school diploma, and its overall average of 17 percent is well above Kansas’ average. The U.S. rate remained constant throughout the period at 18 percent. This is an important trend for Kansas to maintain and is especially important as it seeks to attract technology-based businesses, which require a well-educated workforce.

“Kansas has shown a steady increase in the number of persons with at least a bachelor’s degree, up from 26% in 1995 to 28% in 1997.”
Indicator 24
High School Graduation Rates

Kansas drop-out rate is low

Indicator Significance

As employers and perspective businesses continue to seek better-educated workers, the number of workers with at least a high school diploma gains significance. Nearly all jobs offering stability and long-term employment require a minimum of a high school diploma. Without this minimum education level, workers may find it difficult to locate gainful employment, and may require other means of support.

Kansas Performance

Kansas’ high school completion rate of 91.6 percent for the period 1994-96 was well above the national average of 85.8 percent for the same period and was 10th overall nationally. Of the six surrounding states, only Nebraska, at 93.3 percent, had a higher graduation rate than Kansas. On average, Kansas workers are better educated than others regionally and nationally. This is important for two reasons. First, it increases the likelihood of the employee’s success in the workplace. Second, it is an attractive scenario for employers considering Kansas as a place to locate.

24. High School Completion Rates

<table>
<thead>
<tr>
<th>State and 1994-96 National Rank</th>
<th>Completion Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>85.7</td>
</tr>
<tr>
<td>KS 10th</td>
<td>91.4</td>
</tr>
<tr>
<td>NE 4th</td>
<td>92.5</td>
</tr>
<tr>
<td>IA 10th</td>
<td>94.0</td>
</tr>
<tr>
<td>MO 24th</td>
<td>88.3</td>
</tr>
<tr>
<td>CO 25th</td>
<td>87.2</td>
</tr>
<tr>
<td>OK 31st</td>
<td>81.8</td>
</tr>
<tr>
<td>AR 37th</td>
<td>87.7</td>
</tr>
</tbody>
</table>

Source: National Center for Education Statistics.

"On average, Kansas workers are better educated than others regionally and nationally."
Indicator 25
SAT and ACT Scores

Kansas students poised for college success

Indicator Significance

As students prepare for higher education, one consistent requirement by nearly all colleges and universities is completion of the SAT or ACT Assessment. These scores reflect students’ readiness for the rigors of postsecondary education and speak to the quality of the state’s educational system. Having a college-educated workforce is critical to a state’s ability to supply strategic industries with a quality workforce.

Kansas Performance

Kansas students scored well above the national average on both the SAT and ACT. In fact, Kansas students had the fifth best SAT scores and the 14th best ACT scores. This indicates Kansas students are more likely to succeed at the postsecondary level. Also, it is a testament to the strength of Kansas’ elementary and secondary schools. Kansas must continue to provide a high-quality education for its students.

It is important to note that most midwestern colleges and universities require the ACT. Many schools outside the midwest require the SAT. Consequently, only nine percent of Kansas students took the SAT in 1998 compared with the national average of 43 percent, while 74 percent took the ACT in 1998 compared with the national average of 37 percent.

"Kansas students scored well above the national average on both the SAT and ACT."

Source: College Board.

Source: ACT, Inc.
Indicator 26
Math and Science Degrees

Kansas ranks behind the nation in math and science degrees awarded

Indicator Significance

Math and science graduates (including engineering and social sciences) are the backbone of any technology-based business. To attract and maintain these businesses, a state must demonstrate an ability to supply a workforce educated in math and science. The percentage of math and science graduates from the state’s colleges and universities is one indicator of this ability.

Kansas Performance

Kansas is graduating slightly more math and science students than its neighboring six states, with the exception of Colorado. In 1995, nearly 40 percent of all Kansas postsecondary degrees were in math and science compared with 50 percent in Colorado and 42 percent nationally. Although Kansas ranks relatively high regionally, it ranks low nationally. If Kansas is to be competitive in attracting technology-based businesses, a rank of 36th is not good enough. The whole region must improve and Kansas must take the lead.

26. Percentage of Math and Science Degrees Awarded to All Students

<table>
<thead>
<tr>
<th>State and 1995 National Rank</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. 36th</td>
<td>39</td>
</tr>
<tr>
<td>KS 2nd</td>
<td>36</td>
</tr>
<tr>
<td>CO 39th</td>
<td>42</td>
</tr>
<tr>
<td>MO 44th</td>
<td>51</td>
</tr>
<tr>
<td>AR 44th</td>
<td>38</td>
</tr>
<tr>
<td>IA 46th</td>
<td>37</td>
</tr>
<tr>
<td>NE 36th</td>
<td>33</td>
</tr>
<tr>
<td>OK 46th</td>
<td>33</td>
</tr>
</tbody>
</table>

1991

Source: The National Education Goals Panel.

“If Kansas is to be competitive in attracting technology-based business, a rank of 36th is not good enough. The whole region must improve and Kansas must take the lead.”
Indicator 27
Engineering Degrees

Engineering graduates in good supply

Indicator Significance

States with substantial university engineering programs are better able to serve the workforce needs of technology-oriented companies. This indicator shows how many new engineers are potentially available each year from Kansas universities.

Kansas Performance

In recent years, the ratio of engineering degrees awarded in Kansas has nearly matched national trends. At the undergraduate level, there was a decrease of 8.5 percent in degrees awarded from 1991-97, which is greater than the 1.6 percent decrease at the national level. However, at the graduate level, there was an increase of 1.4 percent in masters degrees awarded over this period, which was greater than the 7.5 percent increase at the national level. Kansas is graduating a higher proportion of engineering students with masters degrees than it did at the start of the decade. This is a favorable trend providing the state’s technology firms with access to more graduate engineers.

At the doctoral level, Kansas graduated 39 engineers in 1997, which was 4.0 percent of all degrees awarded. Nationally there were 6,208 Ph.D.’s awarded in engineering, which was 6.7 percent of the total.

Kansas also nearly matched the U.S. in the type of engineering degrees awarded. There is no indication that Kansas is lagging in the production of graduates for any of the major engineering areas. Overall, engineering graduates are a strength for Kansas technology-based industries.

27a. Kansas Engineering Degrees Awarded by Degree Level

Source: National Center for Education Statistics.

27b. Kansas Engineering Degrees Awarded by Type, 1996-97

Source: National Center for Education Statistics.
Indicator 28
Science and Engineering Graduate Students

Kansas excels at educating science and engineering graduate students

Indicator Significance

Science and engineering students who receive graduate educations, are important members of the innovation and technology workforce. Technology and innovation-based companies seek individuals with graduate educations for their best jobs. These persons provide leadership and are also a key source of idea generation and problem-solving.

Kansas Performance

Kansas educated more graduate level scientists and engineers per million population in 1996 than any other state except Massachusetts. In fact, the number has increased 27 percent since 1990 when there were 1,786 graduate students per million population compared with 2,271 in 1996. Further, Kansas’ trend is contrary to the national trend. From 1990-96, the U.S. fell slightly from 1,592 to 1,567 in number of science and engineering graduate students per million population. This means that Kansas has a strong base from which to provide a quality workforce for technology and innovation-based companies.

"Kansas educated more graduate level scientists and engineers per million population in 1996 than any other state except Massachusetts."
Indicator 29
Ph.D. Scientists and Engineers

Kansas trails the nation and region in doctoral scientists and engineers in the workforce

Indicator Significance

It is not enough for a state to merely educate scientists and engineers at the doctorate level. It must also retain them for employment within the state. These highest-educated members of the workforce are the driving force for technology breakthroughs and innovation.

Kansas Performance

Kansas has failed to attract and retain doctorate scientists and engineers. In 1996, Kansas had the second highest number of science and engineering graduate students per capita. Yet, in 1995 (the most recent year for which national data are available), Kansas ranked 38th per capita for number of doctoral level scientists and engineers in the workforce, worse than all of the other surrounding six states except Arkansas. If Kansas is to compete in key technology and innovation industries, this phenomenon, known as brain drain, is of critical importance. Kansas must improve its ranking of 38th.

"Kansas has failed to attract and retain doctorate scientists and engineers."
Indicator 30
Relative Funding of Kansas Instructional Faculty Salaries

Kansas faculty salaries fall below peers

Indicator Significance

This indicator measures faculty salaries at Kansas Regents' institutions in relation to peer universities.* Faculty participate in a national labor market. If Kansas universities are to attract and retain quality faculty, salaries must be competitive nationally. The faculty most able to move to other universities are those most in demand—those with the best teaching or research records. A state with below-average salaries is at risk of losing its best faculty. Also, universities with low salaries will hire new faculty and provide them with experience and training. As they become most productive, these faculty will leave for universities offering higher salaries. In contrast, a state with high faculty salaries can compete nationwide for the most effective teachers and researchers.

Kansas Performance

Kansas' performance on faculty salaries is unsatisfactory. For all Regents' institutions in 1997 and 1998, the average salary was 89.1 percent of the average salaries at peer universities. Of the three research universities, Wichita State's salaries are best at 92.2 percent of peers in 1998. Kansas State University and the University of Kansas are 88.0 percent and 88.2 percent respectively. These salary gaps are large enough to have labor market implications.

Relatively low faculty salaries are particularly significant for the technology-related areas of engineering, math, and the natural sciences. Effective teacher/researchers in these areas are in high demand as most major research universities are seeking to strengthen their technology-related programs. The Kansas technology base is dependent on its three research universities. These research institutions cannot compete nationally for top faculty without more competitive salaries.

*Note: See Appendix B for a complete listing of peer institutions used for comparisons.

"The Kansas technology base is dependent on its three research universities. These institutions cannot compete nationally for top faculty without more competitive salaries."
Indicator 31
Internet Connectivity

_Kansas lags nation in Internet connectivity_

Indicator Significance

An Internet host is any computer system physically connected to the Internet. Hosts per 1,000 population indicate the extent to which businesses, schools, other institutions, and individuals are connected to the Internet. It is essential for businesses to be connected to the Internet to deal with customers and/or suppliers; it is equally important for students and individuals to have access to the Internet to develop the skills increasingly important to remain competitive. A high score indicates that a state is likely to be adapting to this important new technology in a satisfactory manner.

Kansas Performance

Kansas lags the nation in Internet connectivity by a very large margin. At 37 hosts per 1,000 population, Kansas is connected to the Internet at about half the rate of the U.S. This difference is too large and indicates a weakness in adapting to Internet technology. Kansas ranks 32nd out of the 50 states. Regionally, Kansas is in the middle of the six other states and lags behind Colorado and Nebraska by significant margins.

31. 1998 Internet Connectivity by State and National Rank

Source: Matrix Information and Directory Services (MIDS) and U.S. Bureau of the Census.

"Kansas is connected to the Internet at about half the rate of the U.S. This difference is too large and indicates a weakness in adapting to Internet technology."
Indicator 32
Computers and Internet in Elementary and Secondary Schools

Kansas schools lead in providing up-to-date computers, but lag in Internet connectivity

Indicator Significance

If elementary and secondary schools are to realize the benefits of technology in education, teachers and students must have adequate access to computers and the Internet. Increasingly, computer technology is being integrated into the classroom, just as it is integrated into the workplaces students enter as they leave school. Internet access allows students to learn to locate, analyze, and communicate information. Data can be retrieved and sent, e-mail can be exchanged, and information not available in the school library or in the community can be downloaded. When they enter higher education and the workplace, students will be expected to have skills in accessing and using information.

Multi-media computers contain sound cards and a CD-ROM drive. Students need them to utilize fully today’s advanced software and the Internet. The ratio of instructional multi-media computers per 100 students provides a good measure of the accessibility of computers to elementary and secondary school students. While these computers may be located in libraries, media centers, or classrooms, there is an increasing trend to locate computers directly in classrooms, so they can be used as part of day-to-day instruction. Nationally, schools locate about 50 percent of computers in the classroom.

A national effort is under way to provide Internet connections to all schools and classrooms by the year 2000. The percent of classrooms with connected computers provides a measure of how close states are to achieving this goal.

“Kansas schools do an excellent job of providing up-to-date computers for instructional use.”
Kansas Performance

Kansas schools do an excellent job of providing up-to-date computers for instructional use. However, Kansas lags seriously in Internet access. If its students are to keep pace with their national and regional peers, Kansas must invest in connectivity.

Kansas schools rank first in the nation in computer intensity, with an average of 11.1 multi-media computers per 100 students (about nine students per computer). Many of the states in the region do well on this measure, with Nebraska ranked second nationally, and Iowa and Missouri tied for 6th. The national average is 7.7 multimedia computers per 100 students.

Nationally, about 85 percent of schools now offer some Internet access. About 86 percent of Kansas schools are connected. However, there is a wide variation across states in the extent to which Internet access has reached the classroom level. Kansas ranks 36th in the nation and 6th (out of 7) in the region on percent of classrooms connected to the Internet. In contrast, Nebraska, Iowa, and Colorado all rank in the top 25 percent of states. Only 38 percent of Kansas classrooms have Internet access, compared with 79 percent in Nebraska, and 44 percent nationwide.

Lack of connectivity in Kansas is also reflected in data on the number of Internet-connected computers per 100 students. Kansas provides only 3.9 Internet-connected computers per hundred students, as compared to 16.7 connected computers per 100 students in Iowa, 12.2 in Nebraska, and 5.1 nationally.

32b. Percent of Classrooms with Internet Access, 1998

<table>
<thead>
<tr>
<th>State</th>
<th>1998 National Rank</th>
<th>Percent of Classrooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>36th</td>
<td>44</td>
</tr>
<tr>
<td>KS</td>
<td>2nd</td>
<td>38</td>
</tr>
<tr>
<td>NE</td>
<td>7th</td>
<td>66</td>
</tr>
<tr>
<td>IA</td>
<td>13th</td>
<td>59</td>
</tr>
<tr>
<td>CO</td>
<td>17th</td>
<td>53</td>
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<tr>
<td>MO</td>
<td>27th</td>
<td>45</td>
</tr>
<tr>
<td>AR</td>
<td>47th</td>
<td>25</td>
</tr>
</tbody>
</table>

Source: Technology Counts ‘98. Education Week on the Web.

"However, Kansas lags seriously in Internet access. If its students are to keep pace with their national and regional peers, Kansas must invest in connectivity"
Indicator 33
Telecommunications Infrastructure

Kansas’ telecommunications capacity has improved considerably since 1991; on most measures, Kansas exceeds the regional average.

Indicator Significance

The 1990s have seen striking improvements in telecommunications technology. Inter-exchange companies, such as Sprint, MCI, and AT&T, have deployed optical fiber to facilitate long distance transmissions. By 1997, these companies operated fiber networks exceeding 125,000 miles in length. Local telephone providers, such as the Bell companies, have also made substantial investments in fiber technology. Between 1991-97, the miles of fiber network owned by local companies grew by 135 percent and now totals 327,000 miles. At the same time, improvements have been made to the transmission technology, so the capacity to carry signals over optical fiber has expanded by much more than these amounts.

Businesses demand high “bandwidth” for transmitting large data files, video conferencing, and other applications. Households demand high bandwidth for applications such as telecommuting and downloading information from the Internet. Local telephone companies have expanded the delivery of digital services to businesses and households. In addition, cable television companies have started offering Internet services, and “competitive access providers” in major metropolitan areas have created their own fiber networks to serve business customers.

"Kansas leads the region, with fiber comprising 0.69 percent of local loop terminations. However, Kansas still trails the nation."

---

33a. Fiber Cable Intensity for Large Local Telecommunications Companies, 1997 and 1991 (Fiber Optic as a Percent of Total Cable)

Source: Federal Communications Commission.

33b. Fiber in the Local Loop, 1997 (Fiber as a Percent of Total Central Office Terminations)

Source: Federal Communications Commission.
Telecommunications providers employ many methods to provide digital services to businesses and residents. ISDN (integrated services digital network) is an entry level technology. The technology makes use of the copper wire already in place in local networks. To provide ISDN, telecommunications companies must install ISDN-capable switches. Another method of delivering digital services is to run fiber directly into the neighborhoods of business and residential customers. Fiber links may be direct, or the system may be a hybrid of copper and fiber. Still another method, known as xDSL technology, offers the promise of enhancing the capacity of existing copper wire systems. Such technologies are still in their initial deployment stages.

Since there are many ways for telecommunications companies to achieve the same ends, formulating indicators of telecommunications infrastructure is complex. This report focuses on four data items: miles of fiber for local carriers, fiber in telecommunications local loops, ISDN capability, and actual lines with digital service. These indicators cover only large local telecommunications carriers, which are required to file with the Federal Communications Commission.

Miles of fiber cable as a ratio to total cable miles indicates the extent to which local telecommunications companies have invested in upgrading their cable. The capacity of a fiber cable varies depending on how many individual fibers are within the cable and other factors, so this should be considered only as a rough indicator.

Most of the cable employed by local telecommunications companies connects central offices. A small proportion is placed closer to the consumer, in the "local loop." A fiber or wire from a local loop area has a "termination" at a central facility, usually no more than a few miles from the telephone customer. The ratio of the number of fiber versus copper wire terminations at central facilities is a general indicator of how well fiber has penetrated into the neighborhoods where residences and businesses are located.

Although fiber facilitates digital communications, it is not a prerequisite. ISDN service offers digital capacity, although at a lower bandwidth than fiber. Furthermore, the switches used for ISDN are generally upgradable. Most telephone lines in the U.S. are now capable of ISDN service, although relatively few consumers actually purchase ISDN.

“Kansas ranks in the middle of the region in terms of ISDN capacity.”
Kansas Performance

The amount of fiber in local telecommunications networks has expanded greatly since 1991, and now constitutes almost 12 percent of the cable in Kansas, in comparison with about nine percent of cable nationwide. Kansas places second in the region, with a slightly lower cable percentage than Nebraska, the regional leader.

Most of the fiber in use connects the central offices of telecommunications carriers. Fiber is still a rarity in local loops. Fibers constitute less than one percent of local loop terminations nationally. Kansas leads the region, with fiber comprising 0.69 percent of local loop terminations. However, Kansas still trails the nation.

ISDN capability has shown enormous growth in the last five years, both nationally and in Kansas. Nationally, almost three-fourths of the lines of large local carriers are capable of ISDN services. In Kansas, the ratio is about 57 percent. Kansas ranks in the middle of the region in terms of ISDN capacity. In 1991, such capacity was almost nonexistent in Kansas.

A final telecommunications indicator is not really a measure of capacity per se: it is more a measure of demand. The indicator is the number of lines in service actually receiving digital service. The data are presented as “64 kbps equivalents.” This simply means that high capacity lines are given proportionately higher weights in the measurement. In essence, the measurement indicates the percentage of “bandwidth” that is digital. Nationally, about 18 percent of service is digital. Kansas exceeds the national average, but falls far short of Colorado, the regional leader.

"Kansas exceeds the national average [in digital service intensity], but falls far short of Colorado, the regional leader."
Appendix A
Data Sources

This report has benefitted greatly from the innovative example of the Massachusetts Technology Collaborative in assessing innovation and technology within a state. The results of the Massachusetts assessment are found in Massachusetts Technology Collaborative, *Index of the Massachusetts Innovation Economy* (Westborough, MA: Massachusetts Technology Park Corporation, 1997).

I. Kansas Economic Structure

*Indicator 1: Key Industry Clusters and Diversity*

Key industry totals are based on data on Kansas employment and wages that were provided by the Kansas Department of Human Resources from the ES-202 dataset. This administrative dataset covers firms that are required to file unemployment insurance reports. While use of the dataset is restricted, data for this report have been aggregated sufficiently to preserve the confidentiality of individual firms.

Data for U.S. comparisons were provided by Minnesota IMPLAN Group, Inc. (MIG, Inc.). The MIG data are based on a publicly available version of the ES-202 data provided by the U.S. Bureau of Labor Statistics. MIG has developed a procedure to estimate data that are not disclosed in the BLS dataset.

A detailed breakdown of Kansas key industry clusters is found in Appendix B.

*Indicator 2: Employment Growth in Key Industry Clusters*

Calculations for Kansas are based on data from the Kansas Department of Human Resources. U.S. comparisons are based on data provided by Minnesota IMPLAN Group, Inc.

*Indicator 3: Wages and Wage Growth*

Calculations for Kansas are based on data from the Kansas Department of Human Resources. U.S. comparisons are based on data provided by Minnesota IMPLAN Group, Inc.

*Indicator 4: Real Wage and Employment Growth in High-Tech Industries*

Calculations for Kansas are based on data from the Kansas Department of Human Resources. U.S. comparisons are based on data provided by Minnesota IMPLAN Group, Inc.


See Appendix B for a detailed list of high-tech industry sectors.

*Indicator 5: Employment in High-Tech Industries*

Data were provided by the Kansas Department of Human Resources.

*Indicator 6: High-Tech Wages and Employment*

Calculations were based on data for the U.S., Kansas, and other states provided by Minnesota IMPLAN Group, Inc.

*Indicator 7: Average Annual Wage*

Calculations of annual unadjusted wages were based on data for the U.S., Kansas, and other states provided by Minnesota IMPLAN Group, Inc.

Price adjustments were based on a quarterly survey of prices conducted by ACCRA, the American Chamber of Commerce Researchers Association. The survey shows the relative cost of living by city. Survey results are published in ACCRA, *ACCRA Cost of Living Index: Comparative Data for 311 Urban Areas, Fourth Quarter 1996* (Alexandria, VA: ACCRA, 1996).

To form estimates of prices by state (rather than by city), the ACCRA prices for the cities reporting in each state were weighted by population.

*Indicator 8: Median Household Income and Income Distribution*

Calculations for income distribution were based on raw data from U.S. Bureau of Labor Statistics and U.S. Bureau of the Census, *Current Population Survey, Annual Demographic Survey (March CPS Supplement)*, available at http://www.bls.census.gov/cps. The CPS is conducted jointly by the U.S. Bureau of the Census and the U.S. Bureau of Labor Statistics. The raw CPS data include variables for state, household income, and household weight. For each state, the households were ranked by income, household weights were applied, and 20th and 80th percentiles were identified.

**II. Kansas Innovation**

**Introduction**


**Indicator 9: R&D Spending by Universities and Industry**


**Indicator 10: State Government R&D Expenditures**

Data were taken from Battelle Memorial Institute and State Science and Technology Institute, *Survey of State Research and Development Expenditures: Fiscal Year 1995* (Cleveland: Battelle Memorial Institute and Columbus, Ohio: State Science and Technology Institute, 1998).

**Indicator 11: SBIR and STTR Awards**

State-level data on SBIR and STTR awards were provided by the U.S. Small Business Administration. Per capita calculations used population estimates from the U.S. Bureau of the Census.

**Indicator 12: Technology Transfer**

Data on technology transfer at major research universities and hospitals were taken from Daniel E. Massing, ed., *AUTM Licensing Survey: Fiscal Year 1996* (Norwalk, CT: Association of University Technology Managers, Inc., 1998). Kansas institutions included in the annual AUTM survey are the University of Kansas and the Kansas State University Research Foundation.

**Indicator 13: Patents**

Raw data were taken from U.S. Patent and Trademark Office, *Patenting Trends in the United States 1963-1996 (State/County Format, Fractional Counts)*, data on diskette. Per capita numbers were calculated using population estimates from the U.S. Bureau of the Census. Additional information was provided by Levin, Richard C., et al., “Appropriating the Returns from Industrial Research and Development,” in *The Economics of Technical Change*, Edwin Mansfield and Elizabeth Mansfield, eds. (Brookfield, VT: Ashgate, 1993), 242-79.

**III. Kansas Competitiveness**

**Indicator 14: Business Climate**


**Indicator 15: Venture Capital**

Data for this indicator came from PriceWaterhouseCoopers, *Money Tree™ Survey*, available at http://www.pwcglobal.com. PriceWaterhouseCoopers surveys venture capital firms on a quarterly basis. Per capita numbers were calculated using population estimates from the U.S. Bureau of the Census. The breakdown of funding by stage of financing in the second graph in the section does not include those investments that were listed as "not categorized" in the Money Tree™ Survey.

**Indicator 16: Initial Public Offerings**

Data on Securities and Exchange Commission filings for initial public offerings were obtained online from Hoover's Online, *IPO Central*, available at http://www.ipocentral.com.

**Indicator 17: Gazelle Firms**

*Kansas Innovation Index*
Data on total gazelle firms were taken from David Birch, Anne Haggerty, and William Parsons, *Corporate Almanac* (Cambridge, MA: Cognetics, Inc., 1997). Percentages and rankings were calculated by IPPBR.

Data for publicly traded gazelles were extracted from Standard and Poor’s Compustat Database, a product of Standard and Poor’s, a division of The McGraw-Hill Companies. Data were current through July, 1998.

**Indicator 18: Start-ups and Firm Creation**

**Indicator 19: ISO 9000 Compliant Firms**
Raw data on number of ISO 9000 firms were provided by Paul Clay, Mid America Manufacturing Technology Center. Percentages were calculated using data on numbers of establishments from MIG, Inc.

**Indicator 20: Value Added in Manufacturing**

**Indicator 21: Exporting Firms**

The U.S. averages in graphs 21a and 21b are calculated as the average of all 50 states, weighted by number of firms doing business in the state. This takes into account that a firm may operate in several states simultaneously.

**Indicator 22: International Exports**

**IV. Kansas Human Resources and Infrastructure**

**Indicator 23: Workforce Education Level**

**Indicator 24: High School Graduation Rates**
High school completion rates of 18- through 24-year-olds not currently enrolled in high school or below, October 1991-93 and 1994-96, were provided by the National Center for Education Statistics (NCES), *Drop Out Rates in the United States (98-250)* (Table 15). NCES based their information on U.S. Department of Commerce, Bureau of the Census, Current Population Survey, October (various years), unpublished data.

**Indicator 25: SAT and ACT Scores**
Data for the SAT composite scores were provided by the College Board and can be located on the Web at http://www.collegeboard.org/press/senior98/html/sat2.html. Data for the ACT Assessment composite scores were provided by the ACT, Inc., *1998 ACT Composite Averages by State*, available at http://www.act.org/news/98/98states.html.

Data for the SAT and ACT Assessment are based on 1998 high school graduates who took the corresponding test(s) during their high school years.
Indicator 26: Math and Science Degrees
Data were provided by the National Education Goals Panel, National Education Goals, Building a Nation of Learners, 1997 (Washington, D.C.: U.S. Government Printing Office, 1997).

Indicator 27: Engineering Degrees
Data for graph 27a (Engineering Degrees Awarded by Degree Level) were computed using data from the National Center for Education Statistics, Integrated Postsecondary Education Data System Completions Preliminary Data File, 1996-97, available at http://nces.ed.gov/ipeds/c9697. Data for graph 27b (Kansas Engineering Degrees Awarded by Type, 1996-97) were provided from the same NCES source.

Indicator 28: Science and Engineering Graduate Students
Data on the number of science and engineering graduate students were provided by the National Science Foundation, Graduate Students and Postdoctorates in Science and Engineering: Fall 1996 Supplemental Tables (Arlington, VA: National Science Foundation, 1998), Table B-10: Graduate Students in science and engineering fields in all institutions, by geographic distribution: 1989-96. The data can be located on the Web at www.nsf.gov/sbe/srs/nsf98330/htmstart.htm. U.S. Bureau of the Census data were used to compute per capita numbers.

Indicator 29: Ph.D. Scientists and Engineers
Data on employed doctoral scientists and engineers were provided by the National Science Foundation, Characteristics of Doctoral Scientists and Engineers in the United States: 1995, (Arlington, VA: National Science Foundation, 1997), NSF 97-319, Table 25: Employed doctoral scientists and engineers, by geographic location and broad occupation: 1995. U.S. Bureau of the Census data were used to compute per capita numbers.

Indicator 30: Relative Funding of Kansas Instructional Faculty Salaries
Data were provided by the Kansas Office of the Board of Regents, 1998. A detailed list of peer institutions and average faculty salaries is located in Appendix B.

Indicator 31: Internet Connectivity
Data were provided by MIDS, Matrix Maps Quarterly 502. MIDS can be located on the Web at http://www.mids.org. Data are proprietary. U.S. Bureau of the Census data were used to compute per capita.

Indicator 32: Computers and Internet in Elementary and Secondary Schools

Indicator 33: Telecommunication Infrastructure
Fiber percentage, fiber in the local loop, and ISDN capability were compiled from data available from the Federal Communications Commission, Common Carrier Bureau as part of its online database of Automated Reporting Management Information System (ARMIS) reports, available at http://www.fcc.gov/ccb/armis/. ARMIS was initiated in 1987 for collecting financial and operational data from the telecommunications carriers. A carrier is required to file one or more of the various ARMIS reports if its revenues exceed the ARMIS filing threshold (currently $112 million), or if it is a price-cap carrier, regardless of revenues.


Kansas Innovation Index

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# Appendix B

## Classifications and Definitions

### Indicator 1. Key Industry Clusters and Diversity

Industries comprising Kansas key industries are listed below by standard industrial classification (SIC) code.

<table>
<thead>
<tr>
<th>SIC Code</th>
<th>Industry Name</th>
<th>SIC Code</th>
<th>Industry Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>372</td>
<td>Aircraft and parts</td>
<td>131</td>
<td>Crude petroleum and natural gas</td>
</tr>
<tr>
<td>376</td>
<td>Guided missiles, space vehicles, parts</td>
<td>2911</td>
<td>Petroleum refining</td>
</tr>
<tr>
<td></td>
<td><strong>Materials</strong></td>
<td></td>
<td><strong>Value-added agriculture</strong></td>
</tr>
<tr>
<td>281</td>
<td>Industrial inorganic chemicals</td>
<td>201</td>
<td>Meat products</td>
</tr>
<tr>
<td>282</td>
<td>Plastics materials and synthetics</td>
<td>202</td>
<td>Dairy products</td>
</tr>
<tr>
<td>284</td>
<td>Soap, cleaners, and toilet goods</td>
<td>203</td>
<td>Preserved fruits and vegetables</td>
</tr>
<tr>
<td>285</td>
<td>Paints and allied products</td>
<td>204</td>
<td>Grain mill products</td>
</tr>
<tr>
<td>286</td>
<td>Industrial organic chemicals</td>
<td>205</td>
<td>Bakery products</td>
</tr>
<tr>
<td>287</td>
<td>Agricultural chemicals</td>
<td>206</td>
<td>Sugar and confectionery products</td>
</tr>
<tr>
<td>289</td>
<td>Miscellaneous chemical products</td>
<td>207</td>
<td>Fats and oils</td>
</tr>
<tr>
<td>295</td>
<td>Asphalt paving and roofing materials</td>
<td>208</td>
<td>Beverages</td>
</tr>
<tr>
<td>30</td>
<td>Misc. Rubber and Plastic Products</td>
<td>209</td>
<td>Misc. food and kindred products</td>
</tr>
<tr>
<td>33</td>
<td>Primary metal industries</td>
<td></td>
<td><strong>Information and Communications</strong></td>
</tr>
<tr>
<td>34</td>
<td>Fabricated metal products</td>
<td>357</td>
<td>Computer and office equipment</td>
</tr>
<tr>
<td>3624</td>
<td>Carbon and graphite products</td>
<td>366</td>
<td>Communications equipment</td>
</tr>
<tr>
<td>8734</td>
<td>Testing laboratories</td>
<td>367</td>
<td>Electronic components and accessories</td>
</tr>
<tr>
<td></td>
<td><strong>Printing and publishing</strong></td>
<td>369</td>
<td>Misc. electrical equipment &amp; supplies</td>
</tr>
<tr>
<td>272</td>
<td>Periodicals</td>
<td>481</td>
<td>Telephone communication</td>
</tr>
<tr>
<td>273</td>
<td>Books</td>
<td>482</td>
<td>Telegraph &amp; other communications</td>
</tr>
<tr>
<td>274</td>
<td>Miscellaneous publishing</td>
<td>483</td>
<td>Radio and television broadcasting</td>
</tr>
<tr>
<td>275</td>
<td>Commercial Printing</td>
<td>484</td>
<td>Cable and other pay TV services</td>
</tr>
<tr>
<td>276</td>
<td>Manifold business forms</td>
<td>489</td>
<td>Communication services, nec</td>
</tr>
<tr>
<td>277</td>
<td>Greeting cards</td>
<td>737</td>
<td>Computer and data processing services</td>
</tr>
<tr>
<td>278</td>
<td>Blankbooks and bookbinding</td>
<td></td>
<td><strong>Bio-tech</strong></td>
</tr>
<tr>
<td>279</td>
<td>Printing trade services</td>
<td>2833</td>
<td>Medicinals and botanicals</td>
</tr>
<tr>
<td></td>
<td><strong>Motor vehicles and parts</strong></td>
<td>2834</td>
<td>Pharmaceuticals</td>
</tr>
<tr>
<td>371</td>
<td>Motor vehicles and equipment</td>
<td>2835</td>
<td>Diagnostic substances</td>
</tr>
<tr>
<td></td>
<td><strong>Industrial equipment excl. computers</strong></td>
<td>2836</td>
<td>Biological products</td>
</tr>
<tr>
<td>351</td>
<td>Engines and turbines</td>
<td>384</td>
<td>Medical instruments and supplies</td>
</tr>
<tr>
<td>352</td>
<td>Farm and garden machinery</td>
<td>385</td>
<td>Ophthalmic goods</td>
</tr>
<tr>
<td>353</td>
<td>Construction and related machinery</td>
<td>8731</td>
<td>Commercial physical research</td>
</tr>
<tr>
<td>354</td>
<td>Metalworking machinery</td>
<td></td>
<td><strong>Engineering and architectural services</strong></td>
</tr>
<tr>
<td>355</td>
<td>Special industry machinery</td>
<td>871</td>
<td>Engineering &amp; architectural services</td>
</tr>
<tr>
<td>356</td>
<td>General industrial machinery</td>
<td></td>
<td><strong>Fire, casualty, and marine insurance</strong></td>
</tr>
<tr>
<td>358</td>
<td>Refrigeration and service machinery</td>
<td>633</td>
<td>Fire, marine, and casualty insurance</td>
</tr>
<tr>
<td>359</td>
<td>Industrial machinery, nec</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Indicator 5. Employment in High-Tech Industries
The definition of high-tech used in this report comes from two sources: an article by Luker and Lyons in Monthly Labor Review, and a list provided by the American Electronics Association (see Appendix A for complete references).

<table>
<thead>
<tr>
<th>SIC Code</th>
<th>Industry Name</th>
<th>Amer. Elect. Assoc.</th>
<th>Luker and Lyons</th>
</tr>
</thead>
<tbody>
<tr>
<td>131</td>
<td>Crude petroleum and natural gas</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>211</td>
<td>Cigarettes</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>281</td>
<td>Industrial inorganic chemicals</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>282</td>
<td>Plastics materials and synthetics</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>283</td>
<td>Drugs</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>284</td>
<td>Soaps, cleaners, and toilet goods</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>285</td>
<td>Paints and allied products</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>286</td>
<td>Industrial organic chemicals</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>287</td>
<td>Agricultural chemicals</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>289</td>
<td>Miscellaneous chemical products</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>291</td>
<td>Petroleum refining</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>335</td>
<td>Nonferrous rolling and drawing</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>355</td>
<td>Special industry machinery</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>357</td>
<td>Computer and office equipment</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>362</td>
<td>Electrical industrial apparatus</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>365</td>
<td>Household audio and video equipment</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>366</td>
<td>Communications equipment</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>367</td>
<td>Electronic components and accessories</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>371</td>
<td>Motor vehicles and equipment</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>372</td>
<td>Aircraft and parts</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>376</td>
<td>Guided missiles, space vehicles, parts</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>381</td>
<td>Search and navigation equipment</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>382</td>
<td>Measuring and controlling devices</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>384</td>
<td>Medical instruments and supplies</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>386</td>
<td>Photographic equipment and supplies</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>481</td>
<td>Telephone communication</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>482</td>
<td>Telegraph &amp; other communications</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>483</td>
<td>Radio and television communications*</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>484</td>
<td>Cable and other pay TV services</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>489</td>
<td>Communication services, nec</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>737</td>
<td>Computer and data processing services</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>871</td>
<td>Engineering &amp; architectural services</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>873</td>
<td>Research and testing services</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>874</td>
<td>Management and public relations</td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

* the entire communications industry was included in high-tech for this report, although industry 483 was on neither list.

The twenty largest high-tech industries in Kansas are related to the key industry clusters as follows:

<table>
<thead>
<tr>
<th>SIC Code</th>
<th>High-Tech Industry</th>
<th>Key Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>372</td>
<td>Aircraft and parts</td>
<td>Aircraft and aerospace</td>
</tr>
<tr>
<td>481</td>
<td>Telephone communication</td>
<td>Information and communications technology</td>
</tr>
<tr>
<td>871</td>
<td>Engineering &amp; architectural services</td>
<td>Engineering and architectural services</td>
</tr>
<tr>
<td>874</td>
<td>Management and public relations</td>
<td>None</td>
</tr>
<tr>
<td>371</td>
<td>Motor vehicles and equipment</td>
<td>Motor vehicles and parts</td>
</tr>
<tr>
<td>737</td>
<td>Computer and data processing services</td>
<td>Information and communications technology</td>
</tr>
<tr>
<td>355</td>
<td>Special industry machinery</td>
<td>Industrial equipment excl. computers</td>
</tr>
<tr>
<td>131</td>
<td>Crude petroleum and natural gas</td>
<td>Energy: Oil and gas</td>
</tr>
<tr>
<td>873</td>
<td>Research and testing services</td>
<td>Materials and Bio-tech</td>
</tr>
<tr>
<td>483</td>
<td>Radio and television broadcasting</td>
<td>Information and communications technology</td>
</tr>
<tr>
<td>366</td>
<td>Communications equipment</td>
<td>Information and communications technology</td>
</tr>
<tr>
<td>484</td>
<td>Cable and other pay TV services</td>
<td>Information and communications technology</td>
</tr>
<tr>
<td>382</td>
<td>Measuring and controlling devices</td>
<td>None</td>
</tr>
</tbody>
</table>

Kansas Innovation Index 53
SIC Code | High-Tech Industry |
---|---|
291 | Petroleum refining |
335 | Nonferrous rolling and drawing |
281 | Industrial inorganic chemicals |
384 | Medical instruments and supplies |
289 | Miscellaneous chemical products |
283 | Drugs |
362 | Electrical industrial apparatus |

**Key Cluster**
- Energy: oil and gas
- Materials
- Bio-tech
- Bio-tech
- None

**Indicator 15: Venture Capital**
As of July, 1998, publicly traded firms that listed Kansas as their primary business location included:

**Firm Name**
- ADVANCED FINANCIAL
- AIRPORT SYSTEMS INTL INC
- AMARILLO MESQUITE GRILL INC
- AMERICAN RESTAURANT -LP
- AMERIRESOURCE TECHNOLOGIES INC
- APPLEBEES INTC INC
- ATCHISON CASTING CORP
- BUTLER NATIONAL CORP
- CANDLEWOOD HOTEL COMPANY INC
- COLEMAN CO INC
- COLLINS INDUSTRIES INC
- CRAMER INC
- DUCKWALL ALCO STORES INC
- ELECTRONIC PROCESSING INC
- FIRST INDEPENDENCE CORP/DE
- GOLD BANC CORP INC
- HIGH PLAINS CORP
- IFR SYSTEMS INC
- INFINITY INC
- INTEGRATED MEDICAL RESOURCES
- INTER-CONTINENTAL SVCS CORP
- LAB HOLDINGS INC
- LABONE INC
- LANDMARK BANCSHARES INC/KS
- LATSHAW ENTERPRISES INC
- LAYNE CHRISTENSEN CO
- LONE STAR STEAKHOUSE SALOON
- MIDWEST GRAIN PRODUCTS INC
- MNB BANCSHARES INC
- MONARCH CEMENT CO
- NEW YORK BAGEL ENTRPRIS INC
- NOVASTAR FINANCIAL INC
- NPC INTERNATIONAL INC
- OTR EXPRESS INC
- PAYLESS SHOESOURCE INC
- PETROGLYPH ENERGY INC
- REPUBLIC GROUP INC
- SEABOARD CORP
- SEALRIGHT CO INC
- SLH CORP
- TRANSFINANCIAL HOLDINGS INC

**Firms included in the Kansas Innovation Index included:**

**Firm Name**
- UNITED STATES EXPLORATION
- WADDELL & REED FINL INC -CL A
- WESTERN RESOURCES INC
- WINCO PETROLEUM CORP
- YELLOW CORP

**Indicator 16. Initial Public Offerings**
For this section, high-tech was defined as firms in the following industries: aerospace; automotive; biomedical and genetic products; cable TV; chemicals; computers (software, hardware, online, other); data collection and systems; drugs; electrical and electronics; instruments—control and scientific; laser; medical products and services, military equipment, photographic equipment and supplies, pollution control equipment and services, telecommunications, video equipment; vitamins and nutritional products; wire & cable products; and mining exploration.

**Indicator 30. Relative Funding of Kansas Instructional Faculty Salaries**
Kansas Regents Peer Institutions and Average Faculty Salaries, Fiscal Year 1998

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Kansas</td>
<td>$55,818</td>
<td>Kansas State University</td>
<td>$50,042</td>
</tr>
<tr>
<td>University of Colorado</td>
<td>$60,848</td>
<td>Colorado State University</td>
<td>$60,656</td>
</tr>
<tr>
<td>University of Iowa</td>
<td>$65,981</td>
<td>Iowa State University</td>
<td>$63,158</td>
</tr>
<tr>
<td>University of North Carolina</td>
<td>$71,463</td>
<td>North Carolina State University</td>
<td>$66,171</td>
</tr>
<tr>
<td>University of Oklahoma</td>
<td>$54,037</td>
<td>Oklahoma State University</td>
<td>$55,079</td>
</tr>
<tr>
<td>University of Oregon</td>
<td>$50,352</td>
<td>Oregon State University</td>
<td>$52,342</td>
</tr>
<tr>
<td>Wichita State University</td>
<td>$47,752</td>
<td>Emporia State University</td>
<td>$41,593</td>
</tr>
<tr>
<td>University of Akron (Ohio)</td>
<td>$53,652</td>
<td>Pittsburg State University</td>
<td>$45,111</td>
</tr>
<tr>
<td>University of Nevada Las Vegas</td>
<td>$57,654</td>
<td>Fort Hays State University</td>
<td>$41,232</td>
</tr>
<tr>
<td>Portland State University (Oregon)</td>
<td>$50,576</td>
<td>Western Carolina State University</td>
<td>$50,237</td>
</tr>
<tr>
<td>Oakland University (Michigan)</td>
<td>$58,821</td>
<td>Northwest Missouri State University</td>
<td>$43,683</td>
</tr>
<tr>
<td>Old Dominion (Virginia)</td>
<td>$56,803</td>
<td>Salisbury State University (Maryland)</td>
<td>$47,839</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Northern Michigan University</td>
<td>$52,673</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eastern Washington University</td>
<td>$45,889</td>
</tr>
</tbody>
</table>

Source: Kansas Office of the Board of Regents.
“We live in a world economy where virtually every aspect of our life is touched by high technology. The states who make a major investment in research and technology commercialization will be the winners and those who do not will be the losers in the race to create a better future for the citizens of their state.”

— Robert J. Marcusse, President, Kansas City Area Development Council

“Higher education institutions in Kansas are in the process of adopting the principle that technological innovation is essential for incorporation into undergraduate and graduate programs. This is important in order to help keep students competitive in the international job market. Moreover, universities are encouraging faculty and students to transfer their basic research innovations into the commercial sector. In today’s advanced technological society, innovation is the basis for all future products and services, therefore it is at the heart of successful educational and manufacturing efforts.”

— John R. Darling, President, Pittsburg State University

“For the past five years, we have watched KTEC grow into a premier resource for building new ideas and businesses in technology. As a global firm, we are familiar with the many state and regional agencies often started to help nurture different forms of technology, but few have achieved the strength and breadth of what we have seen from KTEC.”

— John G. Voeller, CTO and Senior Partner, Black & Veatch Engineers

“If Kansas is to maintain its edge in developing business in the highly competitive economy, it must aggressively support the process of turning good ideas into viable business opportunities.”

— Senator Dick Bond

“The creation of new technology companies is essential to the economic growth and prosperity of Kansas. By increasing investment in research and development, creating affordable capital, and forming partnerships between education and industry, KTEC is helping to create the companies that will build our future.”

— John Hunter, President, Dream Wings, LLC
“The growth of research and the development of new technology at our universities and in our industries is vital to the economic well-being of the state and its residents. Success in these efforts to position Kansas among the nation's leaders in economic growth early in the next century depends on our ability to make focused investments in the state's strategic technologies. Everyone in Kansas will benefit from the new jobs and rising state income that will be generated from the discoveries and technological advancements made possible by these investments.”

Eugene M. Hughes, President, Wichita State University

“One of my first actions after election to the United States Senate was to form an Advisory Committee on Science, Technology and the Future. Some 38 Kansas leaders in industry, government and education have been invited to volunteer their time and best efforts to strengthen the position of Kansas in the national agenda for science and technology. The Committee has formed specific working Task Forces in the leading technological areas existing in our state, and are working hard to extend our involvement in each of these areas. I am confident the net result of all our efforts jointly will be the continued growth of a stable high-tech job base for the people in this state.”

Senator Pat Roberts

“Successful high tech efforts produce a windfall of benefits to an areas' economy. Top quality research and a capable and available work force combined with sufficient access to capital are necessary elements to place Kansas in a competitive position for the 21st century.”

Peter T. Higuchi, President, CyDex, Inc.

“If Kansas is to maintain its edge in developing business in the highly competitive economy, it must aggressively support the process of turning good ideas into viable business opportunities.”

Senator Dick Bond

“Higher education institutions in Kansas are in the process of adopting the principle that technological innovation is essential for incorporation into undergraduate and graduate programs. This is important in order to help keep students competitive in the international job market. Moreover, universities are encouraging faculty and students to transfer their basic research innovations into the commercial sector. In today’s advanced technological society, innovation is the basis for all future products and services, therefore it is at the heart of successful educational and manufacturing efforts.”

John R. Darling, President, Pittsburg State University