

16 Kansas S&T Initiatives Fuel the New Knowledge Economy

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A nation that depends on others for basic scientific knowledge will be slow to progress in its intended position regardless of its mechanical skill. It is very easy to say that if you do not feel that same way about your state, you are going to have difficulty competing in these new global times—so states have to take control of their own destinies rather than depend on other people.

Kansas has about 2.6 million people and a gross state product of \$75 billion. Most people view Kansas as an agricultural state, but actually about 20 percent of our economy is manufacturing, which is actually higher than the national average. So over the last hundred years, we have made a progression from an agricultural economy to one that is very technology oriented.

In Kansas, we have three primary organizations involved in economic development: Kansas, Inc., a strategic planning and think tank; the Kansas Department of Commerce and Housing, a traditional economic development agency; and the Kansas Technology Enterprise Corporation (KTEC), which is dedicated to science and technology and economic development.

KTEC was created by the legislature in 1986. It is basically a holding company with a diverse portfolio of programs and investment strategies and a number of independent affiliates that work within a state-wide network. Less than seven percent of our \$14 million budget goes to operations and overhead. The majority goes to programs that direct-

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ly further our mission, which is “to create and grow Kansas enterprises through technological innovation.”

One thing that is unique about KTEC is our ability, through our legislation, to take equity and royalty positions in the investments we make in science and technology. Some states must change their constitutions or do not have the appropriate constitutions to assume stakeholder positions.

One hundred percent of our state funding comes from the Economic Development Initiative Fund, which was created for economic development purposes at the same time our economic development organizations were restructured in 1986. The EDIF is comprised of revenues from the Kansas Lottery and Gaming Commission, so no taxpayer dollars go into the funding of this KTEC programs. Because Kansas is a relatively poor with regards to technology resources, we must leverage our state investments. Most of our programs require matching dollars—whether it be from federal programs or the private sector. Because of our ability to reinvest returns that are generated from our royalties and equity positions, we have developed a sustainable development model, which becomes less dependent on public investment as the programs mature.

What are some of the unique characteristics about KTEC? It is a single entity in the state responsible for all science and technology economic development programs. A number of states have multiple organizations and have fragmented initiatives but through KTEC, all Kansas technology programs are under one umbrella.

Although we are a state agency created by the legislature, our structure is more similar to a private business. We have corporate bylaws and a 20-member Board of Directors. Because half of our board members are from industry, the private sector plays a major leadership role in directing the implementation of our programs. We have subsidiaries that are for-profit corporations but we have all the powers of a governmental agency.

KTEC has survived through four administrations—both Republican and Democrat—since its inception in 1986. Have we been successful? We view returns on investment in many different ways.

We have helped generate nearly \$1 billion in sales with the companies that we work with. We have helped start up 242 companies. Almost 12,000 jobs have been created and over 400 technologies have been developed with our assistance. But, more importantly, we are starting now to generate royalties and equity returns, which can be reinvested and decrease our dependence on the lottery funds that we receive from

the state. Because we are one of the only programs that can show that we are generating returns that actually decrease our budget requirements in the future, our state legislature has been supportive of our mission.

Like any other program, we started modestly; but one way to determine whether you are successful is to look at the amount of dollars you leverage with your co-investment partners. As we have made additional investments in the state, so have our partners: the federal government, venture capitalists, and industry. With our investment partners, we have invested a total of over \$480 million in technology initiatives. And, on an annualized basis, with all the partners' investments, Kansas benefits from \$50 to \$60 million in commitment to science and technology economic development. In fiscal year 1999, each state dollar invested in technology initiatives was leveraged by \$4.70 in federal, industry, and venture capital investments.

You cannot generate a lot of jobs until you get a commercially viable product. It takes time and patience—an average five to seven years—to successfully establish a product in the marketplace. So what is occurring now is consistent growth because the investments that were made several years ago are continuing to create positive economic development trends and increased financial return on investment.

We believe in a life-cycle approach to technology support and development. Our role is to identify the gaps that exist when scientists, engineers, entrepreneurs, and corporations evolve from one stage of a life cycle to the next, and to help them cross the bridge to the next phase. That is how our programs have evolved—by identifying need and creating solutions to gaps in our science and technology infrastructure.

KTEC has three primary areas of focus. The first is research, which involves the Centers of Excellence at our research-based universities and the federal Experimental Program to Stimulate Competitive Research (EPSCoR) program. The second is our investment programs and affiliates. We created a series of seed capital funds and royalty- and equity-based investment programs in the state that we have now been managing for several years. Our third area of focus is small business assistance, which involves our manufacturing extension programs, innovation and commercialization incubators focused on technology companies, and market research organizations to help small businesses.

We started, as most states did, with Centers of Excellence at our research-based universities. These five Centers are focused around the state's strategic technology sectors: aviation; information & telecommunication; biotechnology; polymers; and advanced manufacturing.

Because Kansas is one of the underprivileged states on federal research and development (R&D) dollars, we have been designated an EPSCoR state—a federal program in which funds are allocated by different federal agencies that only states in the program can compete for. This has been a very successful program and has helped strengthen our basic research infrastructure. We created an organization in Kansas called the Kansas Science and Technology Advanced Research Program (K*STAR), which manages the National Science Foundation portion of the EPSCoR program. K*STAR has become a model for our state and is looked upon as a model for certain other EPSCoR states.

Some of the things that came out of the EPSCoR program were interdisciplinary and multi-institutional collaborative research programs, which are difficult when you have institutions and scientists competing with one another. But we are starting to develop collaborative programs with industry that are important to our economy and the researcher's interests.

One important area of focus is manufacturing. We have created a manufacturing technology center to work with small- and medium-sized manufacturers with new manufacturing processes. We have also created an industry-driven K-12 initiative called the Kansas Math and Science Education Coalition, which tries to create greater interest and awareness in the K-12 educational levels and make students aware of the career opportunities that exist in science and technology fields.

Another important area is engineering. We have found that there is a disconnect between industry, universities, and the engineers, so they formed their own consortium to bring the curriculum offerings at the universities more in line with industry skilled workforce needs.

We also have a number of technology business assistance programs. Many help with meetings, website's design and support, establishing partnerships, purchasing assistance, funding travel to Washington to meet with the federal agency heads, bridge funding, equity investments, SBIR assistance, market research, technical research, and commercialization of technologies.

Most KTEC programs require some type of payback, which is not the case with federal programs. We look at our portfolio on a return-on-investment basis. If a technology we are going to invest in is going to be successful, we would like to see a modest return so that we can reinvest those returns in promising new research and commercialization projects.

Two years ago I saw the Massachusetts Technology Index. It occurred to me that because of its wealth of technology resources, Massachusetts

did not really need such an index. Kansas, on the other hand, needed an innovation index. So we developed one of our own. Coming out of this self-analysis were some startling revelations that helped us formulate an updated five-year science and technology plan, which will take us into the new millennium.

The Kansas economy has become much more diverse than it was in the early 1980s, when we had three primary industries: agriculture, aviation, and oil and gas. We now have several industry clusters with over 20,000 employees. All of these have a technology component to them. Aerospace is our largest; then materials, which is very diverse rather than one primary material category; value-added agriculture; and information and communication technologies are our leading industry clusters.

One of the ways we are going to try to help stimulate growth is to employ two different classifications of strategic technologies. We are going to adopt a technology mega-theme this next year, and to complement that we will have an emerging technology strategy. The mega-themes will be those that are critical to the economy of Kansas and where there is global opportunity to grow. Emerging technologies will be those that are not as prominent within the state but still have significant growth opportunities.

It is encouraging to see that many of the high-tech industries we have seen in the United States and globally are also those that are growing most rapidly within the state of Kansas. Sprint is headquartered in Kansas, and information technology and telecommunications is our fastest-growing industry sector—with over 10,000 new employees in the last six years.

About 15 years ago we had five industry clusters with over 1,000 employees each in what we classify as high-tech industry. Today we have 20 clusters. While some of these clusters are just emerging, we have a lot of small clusters to build around from a high-technology perspective. We can employ more of our own people in the state and prevent our graduates from being one of our greatest exports. Developing this critical mass of different industries is extremely important for us to maintain.

One of the most significant revelations from our Innovation Index was that while most people would not classify Kansas as a technology state, over 20 percent of our wages and 12 percent of our employment is in high tech industries. Compare this to the entire U.S., which is 17.6 percent and around ten percent respectively. So from that perspective, we have a higher percentage of technology workers in our state than the

nation does as a whole. The Index also compared Kansas to our border states, and only Colorado has a higher concentration of technology workers than do we.

What are some of the elements necessary to build the innovation economy within your state or country? Research infrastructure is critical, and investment in R&D is a key component for economic development and a driving force for innovation. So how do we rank?

Kansas is not a corporate headquarters state. We have 72,000 businesses in Kansas—65,000 have 19 or fewer employees, while only 160 have 500 employees or more. Boeing, for example, is our largest employer, but Boeing is headquartered in Seattle, Wash. A lot of Boeing's core research is done outside the state of Kansas. Minimal basic research for the company is done in the state.

We rank 32nd in spending per capita in industry R&D. We need to get more industry R&D concentrated within Kansas. We receive less than one-half the national average of per capita R&D spending, and we trail several of our surrounding states.

AAAS is very interested in investment at the university level. We rank 33rd in university research investment. The University of Kansas is our largest research institution, ranking 93 out of the top 100 research institutions in the U.S. Kansas State is just on the cusp of getting to 100. Wichita State is performing about \$20 or \$25 million annually. If we put our whole university infrastructure together, we do about \$250–\$300 million in university research per year.

We have not been as competitive as we need to be with our universities. Some of the new initiatives that we are planning to undertake are going to change that dynamic. The problem is when you are 33rd in the country and you are already designated as an EPSCoR state, it is going to take a quantum leap to get you to the next tier. And getting there, requires a significant investment. Unless that investment is leveraged from all stakeholders, we are destined to stay at our present levels.

Another thing that Kansas lacks is a federal lab. Federal labs become magnets for federal funding and R&D. I do not think we are going to get a major federal lab—especially a Department of Energy lab—in the future so we are going to have to be more dependent on ourselves and generate more partnership initiatives.

One area in which we do well as a state is to invest in R&D. A recent study ranking state government R&D expenditures per capita ranked Kansas first in the country. That does not mean we have the largest

amount of dollars. We rank 10th in gross dollars, but we rank 1st per capita. There are benefits to having a small population base to spread those dollars around. But that statistic also shows that the state is essentially making up for deficiencies from the federal government and industry with its own investment. We need to attract more leverage from some of those other partners.

Our technology base is somewhat dependent on our three research institutions. If we are going to build a science environment and infrastructure, the faculty is the most critical component. Kansas faculty salaries are 90 percent of those at their peer institutions. Unless we get more competitive salaries with the peer institutions, not just the world-class institutions, we cannot make the next leap.

One of the greatest deficiencies that we have in stimulating economic growth is venture capital. On a national basis, \$63 per capita is invested in venture capital. We have about one-third of that, or \$23. In the latest PriceWaterhouseCoopers study that monitored the venture capital funds on a national basis, there was not a single dollar of early-stage capital that came into Kansas over an 18-month period. And if you do not have seed capital, you cannot adequately support technology entrepreneurs. That is one of the major roles that KTEC is fulfilling right now, but we need to get the technologies to an investment grade status to attract external capital. If we want to get the research out of the laboratories to become market viable, we need to have that risk capital available to help them evolve.

To address some of those deficiencies we have developed a series of investment strategies and programs. What we have tried to do at KTEC is design them so that they can be complementary with the federal or private sector programs so that we have an integrated and leveraged commercial capital network. We still have major financial gaps in the commercialization and start-up role, though.

We talk about the importance of research for the innovation economy. Education, training, and skilled workers are also important. You need to have the math, science, and engineering graduates to support the technology base and to attract businesses to your state.

Kansas universities educate more graduate-level scientists and engineers per million in population than any other state except Massachusetts. But you cannot just educate them—you have to find ways to retain them in your state and create employment opportunities. Otherwise, you have the proverbial brain drain.

U.S. Senator Pat Roberts (R-KS) has taken an interest in science and technology in the state. He wants to be the primary liaison in Washington, D.C., and has developed a committee on science and technology for the future, which is complementary to the KTEC initiative. He wants to help Kansas become more competitive within the federal infrastructure, and it is beginning to work.

We have also recognized that we need to become a more strategic with limited resources. We cannot use a peanut butter approach to our budget or our investments in science and technology by spreading limited dollars across too many initiatives. What we are planning to do by our June KTEC board meeting is to have the presidents from our three basic research institutions designate the technologies for which there can be collaborative and focused efforts within the state. We are going to make significant investments in those technologies because there have been some university turf issues in the past that we have had to overcome.

If we are going to build an innovation economy within the state, we need technology-based industry clusters, a research infrastructure to support that innovation, additional risk capital flowing into our state—by either growing our own or developing investment-grade technologies so that others are willing to invest, and we need a skilled workforce available as the innovation becomes successfully commercialized.

In October 1999, we held the first Governor's Economic Innovation Summit, which is very important to Kansas' science and technology initiatives. In order to advance science and technology in a state, you must get the administration behind these initiatives. Until the Innovation Summit, we did not have a governor who showed a commitment to science and technology.

What should the role of government be in science and technology? It should be vision and planning, identification of gaps, and helping to fill those gaps until they can be supported by the private sector. Government should also serve as a catalyst for strategic investments and should manage a balanced portfolio of basic, applied, and commercial technology research with industry. All three stakeholders, government, academia, and industry need to commit to effective collaboration.

So what are the lessons we have learned? First of all, partnerships are very important. It is critical that all stakeholders work together. Rather than each trying to develop unique missions with limited resources and infrastructure, identify projects where you can have overlap—where you have common goals and objectives. Second, you need to have matching investments where you leverage the risk rather than going it alone. Third,

you must focus on only a few things and do them well rather than focus on many things. Also, it is important to find a way for states to graduate out of the EPSCoR system and become more competitive

Change is going to happen, and it is the strongest of the states and universities that are going to survive. It is not the ones that are most skilled, but the ones who are most responsive to the rapidly occurring changes that will win.