MINUTES

SPECIAL COMMITTEE ON KANSAS TECHNOLOGY ENTERPRISE CORPORATION

October 7-8, 2009
Room 545-N—Statehouse

Members Present

Senator David Wysong, Chairperson
Representative Lana Gordon, Vice-chairperson
Senator Pete Brungardt
Senator Tom Holland
Senator Carolyn McGinn
Representative Lisa Benlon
Representative Richard Carlson
Representative Pete DeGraaf
Representative Doug Gatewood
Representative John Grange (excused on 10-7-09)
Representative Dan Kerschen (excused on 10-7-09)
Representative Marvin Kleeb
Representative Jerry Williams

Staff Present

Reed Holwegner, Kansas Legislative Research Department
Dennis Hodgins, Kansas Legislative Research Department
Michael Steiner, Kansas Legislative Research Department
Renae Jefferies, Office of the Revisor of Statutes
Jason Long, Office of the Revisor of Statutes
Margaret Cianciarulo, Committee Assistant

Conferees

Kyle Elliott, Chairman, Kansas Technology Enterprise Corporation
Kevin Carr, Interim CEO, Kansas Technology Enterprise Corporation
Jan Srack, CEO, Matrix Electronic Measuring, Salina
Miriam Ubben, President, Science and Information Technology Association of Kansas
David Kerr, Secretary, Department of Commerce
Sandy Johnson, Mid-American Manufacturing Technology Center
Stan Ahlerich, President, Kansas, Inc.
Lee Lewellen, Thomas P. Miller & Associates, Greenfield, Indiana
Ken Frahm, former KTEC Investment Committee member, Colby

Joel Wiggins, President, Enterprise Center of Johnson County
Dr. Art Hall, Executive Director, Center for Applied Economics, University of Kansas School of Business

Wednesday, October 7

Chairperson Wysong called the meeting of the Special Committee on the Kansas Technology Enterprise Corporation (KTEC) to order at 9:00 a.m. on October 7, 2009. After introductions of the Committee's members and staff, the Chairperson explained that the Special Committee's purpose, as charged by the Legislative Coordinating Council (LCC), was to review the most efficient structure to create and grow Kansas enterprises through technological innovation, study the current operations and findings of KTEC, review the recent Kansas, Inc., evaluation of KTEC, and present the Special Committee's findings to the LCC and the Legislature.

The Chairperson explained that on the first meeting day the Special Committee would hear an overview of KTEC's operations, impacts, and metrics. Then the Special Committee would hear comments from Kansas Department of Commerce Secretary David Kerr, followed by an evaluation from Kansas, Inc. After questions from the Committee concerning the report, KTEC would present testimony regarding progress made on issues identified in the evaluation report. KTEC also would brief the Committee on the status of the agency's budgets for FYs 2010 and 2011. On the second meeting day there would be a presentation on Technology Based Economic Development (TBED). After the Committee's discussion and questions, the Chairperson would offer conclusions and recommendations for the Committee's consideration.

The Chairperson then recognized Reed Holwegner, Kansas Legislative Research Department, to present the history, purpose, and governance of KTEC (Attachment 1). Mr. Holwegner stated that KTEC was created in 1986 and assumed the role of the Kansas Advance Technology Commission that was organized within the Department of Commerce. KTEC's purpose is to provide assistance to businesses in the development of new technologies that, in turn, will create new marketable products and services. The four types of programming that KTEC administers include:

- Research which includes six centers of excellence, state administration of the federal Experimental Program to Stimulate Competitive Research (EPSCoR), and the STAR Fund;
- Business assistance which includes eight regional business incubators and two statewide assistance programs, Network Kansas and the Mid-America Manufacturing Technology Center (MAMTC);
- Investment programs which includes Direct Investments, Angel Networks, and Angels Tax Credit; and
- Entrepreneur development which includes the PIPELINE Program.

KTEC is governed by a board of 20 directors that includes the Governor or (at the Governor's discretion) the Secretary of the Department of Commerce, the Secretary of the Department of Agriculture, four leaders of the Legislature (or their designees), four members of the private sector

appointed by the legislative leaders, and the remaining ten members are appointed by the Governor with six from the private sector and four representing higher education institutions.

Mr. Holwegner concluded his remarks by noting that each Committee member was provided by Kansas, Inc. with a bound hard copy of the KTEC evaluation, thanking Mr. Stan Ahlerich, President of Kansas, Inc., for his cooperation (Attachment 2). There were no questions for Mr. Holwegner.

The Chairperson recognized Mr. Kyle Elliott, Chairman of the KTEC Board of Directors (Attachment 3). Mr. Elliott stated that a majority of the testimony to be heard would revolve around the importance of TBED, specifically what Kansas is doing in this field and how Kansas can maximize its effort. KTEC encourages the development of innovative companies through an integrated set of technical, financial, and business development tools. KTEC programs do not create jobs; that is the responsibility of the companies that are served. Issues raised by the evaluation have been addressed by the KTEC Board with needed changes. According to Mr. Elliott, the KTEC Board is now highly engaged and has a promising strategy underway. There were no questions for Mr. Elliott.

The Chairperson recognized Mr. Kevin Carr, Interim CEO, KTEC. Mr. Carr started his testimony by explaining the importance of technology entrepreneurism (Attachment 4). Entrepreneurial growth companies are responsible for 67.0 percent of new jobs. Those new jobs often pay twice the average salary of non-technology jobs. Technology entrepreneurism can reduce the "brain drain" effect when young, educated people leave their home state for greater opportunities elsewhere. Such entrepreneurism also can diversify the state's tax base.

Mr. Carr explained that rapid growth "gazelle" companies account for 80.0 percent of new jobs. A gazelle company is defined as one that has an annual sales revenue of 20.0 percent or more for four consecutive years. The *2008 State New Economy Index* has ranked Kansas as being eighth in the nation for gazelle jobs. The national technology trade association TechAmerica has ranked Kansas as being first in the nation for the growth of high-tech jobs in 2009. PricewaterhouseCoopers and the National Venture Capital Association recently ranked Kansas as being thirteenth in the nation for venture capital investments for the number of investments made.

Mr. Carr explained the various metrics that are used by KTEC to measure the activity and outcomes of those companies that are assisted. Metrics data are recorded for a minimum of five years following assistance.

Mr. Carr then introduced Ms. Jan Srack, CEO, Matrix Electronic Measuring Data, Salina, Kansas, to provide an example of how KTEC support has benefitted an entrepreneur. Ms. Srack explained the creation of her company, its financial projections, and KTEC's involvement (Page 10 of Attachment 4). Ms. Srack patented a wand which measures auto bodies in need of repair.

A Committee member asked how the wand worked. Ms. Srack replied that the sensors on the end of the wand, in effect, capture images similar to a pair of eyes. The image is then compared to factory specifications to determine repair estimates.

A Committee member asked how much a wand unit costs. Ms. Srack replied that the cost was approximately $28,000.

Mr. Carr provided another example of KTEC's involvement by explaining the support given to CritiTech, a bioscience firm that creates various nano-particles. The nano-particles are used for drug delivery into the patient, device coating, and drug development for cancer and diabetes. Along

with the support of the Lawrence Entrepreneur Center, CritiTech received angel investments and direct KTEC investments of $400,000 from 2001 to 2006. To date, CritiTech has been able to raise $6.3 million in capital. There have been ovarian cancer trials since 2008, and clinical trials for a renal cancer drug are planned for 2010. In 2007 CritiTech had revenue of $500,000 and employed four people; in 2009 the company has estimated it will have revenue of $2.0 million and employ 13 people.

Mr. Carr then explained the research grant programs that are administered by KTEC. EPSCoR is a federal program aimed at improving the competitiveness of academic research in states that have not historically fared well in obtaining federal research funds. Through EPSCoR, small state grants can leverage much larger federal grants for advanced research at doctoral granting universities. Federal research partners include the Departments of Defense and Energy, the Environmental Protection Agency, the National Aeronautic Space Administration (NASA), and the National Science Foundation. The Strategic Technology Research (STAR) Fund is a state extension of EPSCoR. The fund is used to support projects which may not receive EPSCoR funding but have the potential to attract other federal or private industry research grants and to create commercial growth in the state. Mr. Carr provided the Special Committee with data concerning the number of new jobs created and additional research moneys provided by the federal government and industry through EPSCoR and STAR Fund research. Mr. Carr noted that approximately half of the grants awarded by KTEC are through EPSCoR.

A Committee member asked how states qualified for EPSCoR funding. Mr. Carr replied that each of the above mentioned agencies set aside a small percentage of their budget for those states that have been determined by formulas as not having received their fair share of research funding.

Mr. Carr then explained the five centers of excellence that are operational in the state. Each center is affiliated with a university in the state and has its own technology specialization. The centers conduct innovative research and provide technical assistance for client companies. Mr. Carr explained the amount of funding awarded to the centers, the number of jobs created or saved, revenues, and capital investments for each center from 2007 to 2009. He added that the KTEC Board has recently decided to award such funding in the future on a project basis, rather than on a fixed cost method.

A Committee member asked if Kansas was getting more research funding because of KTEC. Mr. Carr estimated that between 30 percent to 50 percent of federal funding could be attributable to KTEC involvement.

Mr. Carr continued with his testimony by describing the entrepreneurial centers. There are seven entrepreneurial centers in the state that are focused on supporting high-tech start-up companies. These companies may arise from either the entrepreneurial community or technology patents created by state universities. For each entrepreneurial center Mr. Carr listed the funding, the jobs created or saved, revenues, and investment capital.

A Committee member then asked about jobs being saved. Mr. Carr replied that most saved jobs could be found in manufacturing; he added that there is some judgment involved when analyzing the number of jobs saved.

A Committee member asked if the state had, in effect, a return on investment and if it included tax credits in its calculation. Mr. Carr said there was no return on investment calculation.

The Special Committee requested Mr. Carr provide a breakdown of KTEC's contribution to the entrepreneurial centers and the centers of excellence that compares total funding with contributions from industry and other sources.

Mr. Carr then explained KTEC's PIPELINE program. The program is designed to identify technology entrepreneurs who have a high potential for success. Those individuals are then given a year-long fellowship that matches them with training, mentors, and other resources. There were no questions regarding the PIPELINE program.

Mr. Carr explained the investment programs at KTEC. The direct investments that KTEC makes in new and existing small businesses are at the pre-venture capital stage because private equity is usually not available at this point. The purpose of such financing is to buffer the risk that small companies incur when developing innovative products. This should give the Kansas economy a broader spectrum of potential high growth companies. KTEC is also the administrative agency for the state's Angel Tax Credit. The tax credit promotes investing into early-stage companies and reducing the risk to the investor.

Mr. Carr then explained the MAMTC. The nonprofit corporation is a subsidiary of KTEC, established to assist Kansas' small and mid-sized manufacturers. It is funded by KTEC, the federal government, and client fees. MAMTC operates the Kansas Innovation Marketplace which is only one of four state sites in the National Innovation Marketplace. MAMTC trains academics, inventors, and entrepreneurs to be able to relate their technology to the business sector. MAMTC also can connect suppliers with new manufacturers in different industries, thus allowing suppliers to diversify and grow. Ms. Sandy Johnson, MAMTC, answered general questions from Committee members.

Mr. Carr then introduced Miriam Ubben, President, Science and Information Technology Association of Kansas (SITAKS) (Attachment 5). Ms. Ubben explained that SITAKS is the trade organization for software and IT companies in Kansas; it was created with initial support of KTEC since there was no such entity in the state. Ms. Ubben explained there are 3,200 software and IT companies in Kansas which employ over 58,000 workers. It has been estimated that these companies contribute more than $4.2 million to local economies. Currently software and IT companies pay 91.0 percent more than the state average wage. SITAKS members are reporting growth in 2009 and continue to hire workers. Ms. Ubben concluded her testimony by explaining SITAKS' legislative platform for the 2010 Session. The Committee had no questions for Ms. Ubben.

Mr. Carr then provided the Committee with the breakdown of funding for the entrepreneurial centers and the centers of excellence that was previously requested (Attachment 6).

Mr. Carr concluded his prepared testimony by explaining that after the evaluation was released, KTEC's staff began to look outside of the organization to see which entities were providing what sort of economic development services. Mr. Carr provided the Committee with a matrix of various technology-based economic development programs (page 19 of Attachment 4) that are provided by various state agencies and others, including KTEC, the Kansas Bioscience Authority, the Department of Commerce, Network Kansas, and the Kansas Small Business Development Center. He noted that all entities facilitate access to state resources, but each entity is providing access to different types and sizes of businesses. Mr. Carr identified areas of overlap between KTEC and the Bioscience Authority in the areas of capital investment and capital assistance.

A Committee member asked how and when the duplication of services with the Bioscience Authority would end. Mr. Carr replied that there would be better coordination with the Bioscience Authority in the future, and KTEC would begin to cease its duplication of effort by the start of the next

fiscal year. Previous investment commitments would continue as stipulated in previous agreements, but new ones would be conducted by the Bioscience Authority.

As there were no further questions of Mr. Carr, the Chairperson recognized David Kerr, Secretary, Department of Commerce, for comments. Secretary Kerr stated the Commerce Department has a number of tools to use, but there is a shortfall regarding small businesses and rural areas. He went on to say that if businesses can generate new jobs and withholding taxes, then the Commerce Department can help. KTEC, he said, filled an economic development gap by helping start-up companies.

A Committee member asked who helps small businesses in rural areas of the state. Secretary Kerr replied that the newly created Office of Rural Opportunity within the Department of Commerce indirectly assists businesses.

A Committee member asked where the Rural Opportunity Office was located. Secretary Kerr replied that it is organized within the Rural Development Division of the Commerce Department and has locations at four local community colleges across the state. The Rural Opportunity Office provides planning support to rural communities. It does not provide financial incentives to rural and small businesses.

A Committee member then asked if there was a one-stop shop for businesses. Secretary Kerr said no; rather, each of the entities listed in KTEC's matrix tries to direct the business or entrepreneur to the right program and service provider.

As there were no more questions or further discussion, the Special Committee received testimony on the evaluation report. The Chairperson recognized Stan Ahlerich, President of Kansas, Inc., who stated the study attempted to address three questions:

- Is KTEC adhering to its statutory obligations;
- Has KTEC initiated its statutorily defined programs and initiatives; and
- What has been the outcome of the KTEC investments?

Mr. Ahlerich then introduced Lee Lewellen of Thomas P. Miller and Associates, Greenfield, Indiana, who conducted the KTEC evaluation (Attachment 7). Mr. Lewellen explained the evaluation process; it included 90 interviews with select stakeholders of KTEC. The evaluators analyzed previous reports that were conducted on KTEC, as well as the agency's annual reports. Data compiled by the Association of University Technology Managers, the State Science and Technology Institute, and the Kauffman Foundation were used in the analysis.

According to Mr. Lewellen, KTEC used its influence to expand the role of universities to include economic development activities. KTEC had significant participation in the development of the Kansas Economic Growth Act of 2004 and in the creation of the Kansas Bioscience Authority. The agency has realized a return on investment for several Kansas companies. KTEC successfully recruited several promising technology companies to Kansas. The agency has increased interaction between members and affiliates of the Kansas TBED community. Mr. Lewellen also pointed out that the metrics used to gauge performance have been disappointing, inconsistent, or misleading. He also observed that financial support for organizations seems to be based upon political or geographic balance, rather than merit.

Mr. Lewellen said there were several common themes that could be identified from the interviews. KTEC was viewed as being either a successful hub for TBED or as an enigmatic

organization. Past and current board members expressed views that they were often left out of the decision-making process. With regard to technology centers and centers of excellence, respondents could not readily identify specific technology areas in which KTEC was operating. Respondents suggested that agriculture-based technology could be a unique opportunity in Kansas; KTEC could provide a platform for cross-technology collaboration. Program participants generally held KTEC in high regards, especially those who received a PIPELINE fellowship. Entrepreneurs who received angel investments were positive about the process used to validate the business. Venture capitalists perceived KTEC's support for a given business or entrepreneur as a stamp of approval. Respondents believed that KTEC has provided Kansas with a technology edge by gathering entrepreneurial information and by matching businesses with researchers; however, respondents could not readily articulate successful metrics by which to judge KTEC's operations. Respondents did not view KTEC's procedures as being transparent. Views were expressed that there was a lack of communication with outside groups, such as legislators.

Mr. Lewellen classified KTEC's programs into three phases: idea and product information, business formation, and equity investment. Idea and product information is carried out at universities. Business formation focuses on incubators and entrepreneurs, and equity investments are conducted by KTEC directly and by angel investors.

In the first phase of university programs, KTEC supports the five centers of excellence. Each center of excellence does not perform equally well. High-performing centers show a pattern of increased contributions from private industry as a percentage of the centers' operating budgets, in which case, KTEC's contribution appeared to be only marginally significant. When comparing EPSCoR funding with state STAR funding, it appeared that STAR-funded projects were able to leverage more research moneys than EPSCoR projects. Mr. Lewellen said there needed to be a way to address underperforming centers.

In the second phase intellectual property is transformed into a commercialized product or service. Mr. Lewellen noted that while resources associated with the incubator program are typically located on campuses and have close ties with university personnel, the client population is more heavily comprised of non-academic entrepreneurs. The other part of the second phase is the PIPELINE program, which is entering its third year of operation. It is a unique program in the country that provides generous support for recipients. Mr. Lewellen suggested that the program be expanded to include more entrepreneurs. It would be preferable for PIPELINE to identify outcomes rather than fellowship activities, but Mr. Lewellen also stated that it is difficult to measure the future impact that PIPELINE entrepreneurs would have on the Kansas economy.

In the third phase, Mr. Lewellen noted that KTEC's investment strategy has changed from one of giving loans and grants to royalty and equity positions. Investments are made through two state funds, the Applied Research Matching Fund and the Technology Commercialization Seed Fund. Companies in which KTEC invests are held by KTEC's wholly owned subsidiary, KTEC Holdings, until the company exits the portfolio via trade sale, acquisition, initial public offer, or liquidation of assets and termination. As of March 2009, KTEC's portfolio stood at $9.147 million with equity in 45 active companies; investments were made between 1997 and December 2008. Beginning in 2002, the number of investments per year has not exceeded 13 companies. Earnings realized through KTEC Holdings are used to augment these investment funds. The other part of the third phase is the Angel Investor Tax Credit program. Since the program's inception in 2004, it has qualified 40 companies for angel investment.

Mr. Lewellen then went through a series of national surveys that compared Kansas TBED with neighboring states.

Mr. Lewellen concluded that Kansas needs a focal point for entrepreneurs and innovators. KTEC could do more to build an entrepreneurial climate in the state, especially by promoting cross-technology innovation and facilitating the commercialization of university research. He further stated that KTEC needs a clear vision of its role in building a successful Kansas economy. Metrics need to be clearly established and regularly measured. The agency, he said, needs more consistent guidance which should be given by the board members.

Mr. Lewellen recommended that KTEC should identify unique technology clusters around which the innovation economy can grow. A clear set of metrics needs to be established for KTEC; metric data then needs to be maintained. Annual reports should be made available through the KTEC website. He further recommended that the board of directors take a stronger decision-making role in the operations of the agency.

A Committee member asked what other states are doing with patents derived from university research. Mr. Lewellen said that colleges have to balance the need of publishing academic research with the desire for patents. Academic research is public in nature, while patents have proprietary rights.

A Committee member commented that there should be a clarification of acronyms and abbreviations used when discussing TBED policy. She also observed that it appears there is no set standard by which to measure economic development success. The Senator then asked about the funding received by centers of excellence. Mr. Lewellen said that state funds are used to obtain additional funding, or to "leverage," from federal or private grants.

A Committee member asked if KTEC and the Department of Commerce were competing to serve the same clients. Mr. Lewellen stated that the two agencies work in a parallel collaboration, serving two different markets.

The Chairperson then called on Mr. Carr to explain KTEC's response to Kansas Inc.'s evaluation report (Attachment 8). Mr. Carr stated that KTEC appreciates the positive recognition noted in the report and has taken measures to deal with the identified issues. In particular, he responded to the following critiques:

- **KTEC should continue to identify unique technology clusters in Kansas around which the innovations economy can be built.**

  KTEC formed a strategic planning task force in June 2009 that is comprised of Board members and staff. The task force identified cluster development as one of four areas for the agency to focus. KTEC has started to evaluate resources within Kansas to identify the technology clusters that should be supported. In September, KTEC started to evaluate the centers of excellence to determine how each center will be aligned with KTEC in the future.

- **KTEC needs to establish a clear and uniform set of metrics, collect and maintain information that supports these metrics, and regularly report progress. Metrics should reflect outcomes rather than activities.**

  KTEC recognizes there is room for improvement in reporting metrics to the Board. To that end, metrics are to be reviewed annually in detail at the Board meeting immediately following the survey process. Mr. Carr provided the metrics that are to be used for each program area.

- **In order to better serve stakeholders and foster a more entrepreneurial culture in Kansas, KTEC should post all annual reports, schedules, minutes, and other documents online.**

  Since April 2009, KTEC has posted all annual reports, the last three years of minutes, and future schedules on the agency's website. KTEC and the other economic development agencies have collaborated to develop a matrix that should improve the understanding of how all agencies work together to provide economic development.

- **KTEC needs mechanisms in place to assure that the Board of directors is fulfilling its fiduciary role and is operating in accordance to statute.**

  KTEC surveyed all Board members prior to the June meeting to ensure their needs were understood and being met. Deficiencies that were raised were addressed prior to the September Board meeting. From now on, the Board will be surveyed biennially to discern its decision-making needs. KTEC developed an intranet website that Board members can access. Board members now sit on each KTEC Committee.

- **Provide thorough and adequate information to the Board well in advance of Board meetings.**

  All KTEC materials that require the Board's approval are posted to the intranet site a minimum of two days in advance of each meeting.

- **Maintain the integrity of the Board nomination and selection process.**

  KTEC notes that the process is controlled by the Legislature and the Governor, and no specific problems relating to the nomination process were cited in the report.

- **Build the Board's capacity to ensure that the entrepreneurs, technology experts, intellectual property attorneys, and financial experts are represented on the Board.**

  The KTEC Board is comprised of members with the expertise specified by statute. The charter of KTEC's Investment Committee was amended in June to include term limits for members. Five new members have been added to the Committee since May 2009. The current Committee includes four Board members.

- **Work with existing companies to identify "orphan" technologies and identify persons that could develop those technologies to the proof-of-concept stage.**

  KTEC's Proof of Concept Program has been in existence for two years. KTEC has funded projects at universities in the state totaling over $100,000.

- **Leverage existing entrepreneurship programs and consider extending the PIPELINE Program to meet the needs of entrepreneurs at different stages of development.**

KTEC will continue to evaluate services that enhance entrepreneur development. PIPELINE has begun to extend its offering to other entrepreneurs and high school students.

The Chairperson then called on Kenneth Frahm, a former KTEC Investment Committee member, who served for 12 years (Attachment 9). Mr. Frahm offered his observations about the KTEC organization and its process. He told the story of how the bio tech firm Edenspace moved to Kansas due to KTEC investment. There were no questions for Mr. Frahm.

The Chairperson then called on Joel Wiggins, President of the Enterprise Center of Johnson County. Mr. Wiggins stated that KTEC provides a competitive advantage to Kansas. There were no questions for Mr. Wiggins.

The Chairperson noted that written testimony in support of KTEC was provided by Wally Kearns, State Director of the Kansas Small Business Development Center (Attachment 10), and Steve Radley, Director of the Kansas Center for Entrepreneurship (DBA Network Kansas) (Attachment 11).

The Chairperson recessed the Special Committee until 9:00 a.m. on October 8.

Thursday, October 8

Upon calling the meeting to order, the Chairperson announced that the Special Committee would begin with a presentation on TBED, followed by preliminary discussions and questions regarding the recommendations the Committee will be making.

The Chairperson then recognized Mr. Ahlerich, who discussed the process used to develop the latest strategic economic plan for the state. He then proceeded to explain the economic landscape in the state. Kansas has a mature economy with a commodity base. Those who sell commodities are "price takers" rather than "price setters," which leads to a diminishing margin of profit. Kansas also has a manufacturing sector, Mr. Ahlerich said, with many businesses employing fewer than 50 employees. Over the last several decades, low-paying manufacturing jobs have been relocated off-shore. Mr. Ahlerich stated that Kansas is in competition with those other states in the middle of the country that could be classified as "fly-over" states.

Mr. Ahlerich then introduced Dr. Art Hall, Executive Director of the Center for Applied Economics at the KU School of Business (Attachments 12 and 13). Dr. Hall stated that TBED is primarily an urban phenomenon where both the volume of entrepreneurial activities and population density matter. Kansas has a disadvantage in both categories except for in the Kansas City and Wichita areas. He offered indexed data comparing high-tech business growth for the United States, the plains states, and Kansas. Since the start of 1990 to the end of the first quarter of 2008, Kansas has had a higher rate of growth than the plains states and the country. He added that most of this growth has occurred around Kansas City, and Wichita accounts for 17.0 percent of the growth.

Dr. Hall continued that at any one time, 10.0 percent to 15.0 percent of businesses in Kansas are new, and about the same percentage of businesses are dying. He observed that nobody really knows when or how TBED initiatives will work, but this economic churning process–over time–will lead to increased productivity that then will build societal prosperity. Dr. Hall stated that the

challenge is to be willing to let go of old jobs and industries in order to get there. Universities can simulate the necessary entrepreneurial activities and population densities. He suggested that the state's goal should be to grow out of the EPSCoR program and be in the top half of research states.

Dr. Hall observed that while KTEC has had some successes, the agency has taken a role of picking winners and losers, similar to how a venture capitalist firm would operate. TBED success should be measured in terms of productivity, capital investment (especially in manufacturing), the gross number of business starts, federal research funding, and private industry research and development funding. He concluded his testimony with the following recommendations:

- Build world-class discovery platforms to simulate across Kansas the "knowledge spillover," collaboration, and increased opportunity awareness that comes from urban density.

- Link state research and development support more tightly to the acquisition of federal research and development funding and strive to increase the number of Kansas-based researchers competing for all manners of federal funding related to scientific research and engineering.

- The State of Kansas should maximize the resources directed to building the research infrastructure and collaborative business environment related to technology-based economic development and minimize the resources directed to investments in individual business ventures.

- Leverage the network of regional technology centers (business incubators) to help build more volume and more critical mass.

A Committee member asked if tech companies relocate to another state. Dr. Hall replied that such businesses rarely leave the geographic area where they start.

A Committee member asked what impact the Internet has on TBED. Dr. Hall stated that the Internet has become a "driver" for such economic development. Businesses start locally, and interpersonal interactions are valuable for business start-ups.

A Committee member commented that the state has incentives to bring out-of-state businesses into Kansas, but not as many incentives to develop businesses already in the state. He asked Dr. Hall how the Committee should look at businesses within Kansas. Dr. Hall replied that every business matters and should be viewed in terms of supporting economic growth, not just technology-based start-up companies.

A Committee member asked Dr. Hall how the state could promote an entrepreneurial climate with limited resources. Dr. Hall said there needs to be increased research funding at the universities, especially for the basic research and applied research categories. This can lead to matching funds from the federal government and the private sector.

A Committee member asked how foreign jobs could be enticed to move to Kansas. Dr. Hall replied that if the state focuses upon making a rich economic environment for entrepreneurial growth, such jobs could be attracted to Kansas.

A Committee member expressed concern that the state may be missing the opportunity to expand TBED into other regions of the state.

A Committee member asked Dr. Hall how the state could keep identified clusters of economic growth. Dr. Hall said that it would be possible by following his previously mentioned first recommendation.

A Committee member asked Dr. Hall to compare his first recommendation with the actions proposed by KTEC. Dr. Hall said that he generally concurs with KTEC's proposals.

A Committee member asked how the state could reduce the drain of young people to other areas of the country. Dr. Hall suggested that the academic tenure system for higher education should not be abolished; rather, a parallel system should be created that encourages economic development. This would be an incentive for some young people to stay in the state.

There were no further questions for Dr. Hall.

The Chairperson then asked the three members of the Committee, Senators McGinn and Holland and Representative Gatewood, who are also members of the KTEC Board, if they noticed any changes to the agency after the evaluation report was released.

As a KTEC Board member for nine years, Representative Gatewood stated there was a night and day difference in the agency's operations, especially with improvements in communications between Board members and staff. He was glad to receive the evaluation because it made the Board make strategic changes. Representative Gatewood believed that Dr. Hall's first and second recommendations had been addressed by the KTEC Board's task force; he added that he commends the cooperation between the Department of Commerce and KTEC. In his opinion, KTEC should be allowed to set its course.

Senator McGinn was appointed recently to the Board. She noticed improvements since the Board's June meeting. Now Board members receive information ahead of time. In her opinion the KTEC Board is not a rubber stamp board; she stated that KTEC should continue to stand alone because otherwise, its programming may get lost in another agency.

Senator Holland concurred with the sentiments expressed. He also recommended allowing KTEC's process to go through.

CONCLUSIONS AND RECOMMENDATIONS

After a short break, the Special Committee began discussing its conclusions and recommendations. Senator Wysong suggested several items for the members' consideration. After discussion, the following points were approved by general consensus to be included in the Special Committee's interim report.

- The Special Committee concludes that the Kansas Technology Enterprise Corporation (KTEC) is a viable entity to the State of Kansas and serves a specific purpose that the Department of Commerce and other economic development entities do not. KTEC needs to remain a stand-alone state agency.

- Due to the 2009 evaluation report performed by Kansas, Inc., KTEC took major steps in restructuring its own leadership, and its board of directors made

significant operational changes. The Special Committee recommends that the KTEC Board remain informed and engaged in all KTEC activities.

- The 2009 evaluation report made several recommendations. KTEC representatives detailed their acceptance of these recommendations and have begun to implement changes (See Attachment 8). The Special Committee commends KTEC's Board and revised leadership for implementing these recommendations.

- The Special Committee looked at duplication of efforts for the state's economic development policies and programs. It found there were two areas that KTEC was duplicating efforts with the Kansas Bioscience Authority. KTEC has agreed that by the start of the next fiscal year, the agency will begin to vacate direct investments in the bioscience arena and end any duplication where possible.

- The Special Committee recommends that the Legislature reconsider its current policy on the Angel Tax Credit and the 10.0 percent "carry forward" position. This cap discourages investment when it is most needed.

- The Special Committee recommends that the state's policies should consider and help foster the growth of jobs and economic development.

- After listening to the TBED presentation by Dr. Art Hall and the ensuing discussion, the Special Committee recommends that KTEC take the four recommendations from that presentation and reconsider its investment strategy (See Attachment 12). There are many needs for economic development in the State of Kansas. KTEC needs to address its investment strategy fully. By implementing the recommendations found in the TBED evaluation, KTEC will become much more successful.

- The Special Committee recognizes KTEC's recent actions are a work in progress. The Committee recommends that KTEC report its progress on an annual basis to the Senate Committees on Commerce and Ways and Means; the House Committees on Economic Development and Appropriations; and the Joint Committee on Economic Development.

- Finally, the Special Committee expresses its gratitude to Kansas, Inc., for its work and presentations.

Prepared by Margaret Cianciarulo
Edited by Reed Holwegner

Approved by Committee on:

January 8, 2010
(Date)

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October 5, 2009

To: Special Committee on KTEC

From: Reed Holwegner, Research Analyst

Re: History, Purpose, and Governance of KTEC

This memorandum provides a brief overview of the history, purpose, and governance of the Kansas Technology Enterprise Corporation (KTEC). The agency was created in 1986 after legislation was recommended by the Joint Legislative Commission on Economic Development. KTEC assumed the role of the Kansas Advanced Technology Commission that was organized within the Department of Commerce.

The purpose of KTEC is to provide assistance to businesses in the development of new technologies that, in turn, will create new marketable products and services. In 1992 KTEC was authorized by statute to establish wholly-owned subsidiaries. The types of programming administered can be classified into the areas of research, business assistance, investment programs, and entrepreneur development. The programming included in each area is outlined below:

I. Research

A. Six Centers of Excellence:
   1. The Advanced Manufacturing Institute, affiliated with Kansas State University, assists companies, entrepreneurs, and academic researchers to develop new technologies and products.
   2. The Biotechnology Innovation & Optimization (BIO) Center, affiliated with the University of Kansas, works to move technology derived from pharmaceutical and biomedical research to the private sector.
   3. The Grain, Research, Analysis, Industry, Nutrition, Security (GRAINS) Center, affiliated with Kansas State University, conducts research and education for the grain industry to ensure safety and competitiveness.
   4. The Information and Telecommunication Technology Center, affiliated with the University of Kansas, is focused on IT economic development.
   5. The Polymer Research Center, affiliated with Pittsburg State University, provides research and technical assistance for the design, testing, and development of polymers, plastics, and wood product.
   6. The National Institute for Aviation Research (NIAR), affiliated with Wichita State University, provides research, training, and product development for the aviation industry.

B. The Experimental Program to Stimulate Competitive Research (EPSCoR) Program is attempts to improve the ability of certain states that have had a historical disadvantage in competing for federal research funding. KTEC administers the program for the state by providing state matching funds. Federal research partners include the Departments of

Special Interim Committee on KTEC
Date: October 7, 2009
Attachment 1

Energy and Defense, the Environmental Protection Agency, NASA, the National Science Foundation, and the National Institute of Health.

C. The STAR Fund is designed to expand university research in Kansas, using federal and private sector funding, in order to produce sustainable innovations that will help to diversify Kansas industry.

II. Business Assistance

A. Business Assistance Incubators are partnerships between the public and private sector that are designed to assist emerging companies and transfer new technologies to the marketplace. There are eight regional business incubators located in Great Bend, Hutchinson, Kansas City, Lawrence (2 incubators), Manhattan, Pittsburg, and Wichita. There are also two statewide business assistance organizations, Network Kansas and MAMTC.

B. Mid-America Manufacturing Technology Center (MAMTC) helps small and medium sized manufacturers by assisting the in modernizing their operations and business practices. Receiving partial funding from the federal government, MAMTC may provide support to either individual or groups of manufacturers.

III. Investment Programs

A. Direct Investments. Each year KTEC invests approximately $1.5 million in early stage companies that have the potential to create high-paying jobs in the state.

B. Angel Networks. Three regional networks (Midwest Venture Alliance, Southeast Kansas Venture Alliance, and Mid-America Angels) provide forums for entrepreneurs and investors to connect with one another.

C. Angels Tax Credit. KTEC administers this state income tax credit that is made available to individual investors that have been willing to provide seed capital for emerging innovative businesses in Kansas.

IV. Entrepreneur Development

A. PIPELINE is the state's entrepreneur fellowship program. Entrepreneurs are identified to spend a year receiving expert assistance with their businesses. They receive education, a mentor, and opportunities to network with other entrepreneurs and business people.

KTEC is governed by a board of directors. In 1986 the size of the board was set at fifteen members including the Governor and the four legislative leaders from the majority and minority caucus groups of the House and Senate The remaining ten board members were appointed by the Governor subject to Senate confirmation. Today there are twenty members on the board which include:

- The Governor or, at the Governor's discretion, the secretary of department of commerce;

- The secretary of the department of agriculture;

- Four members of the Legislature including the speaker of the house, the house minority leader, the president of the senate, and the senate minority leader; each legislative leader, at their discretion, may appoint a replacement member based upon their respective committee assignment;

- Four members from the private sector who are appointed by the above-named legislative leaders who are known for their expertise in the Kansas economy; and

- Ten members appointed by the governor, with six from the private sector and four representing higher education institutions.

Appointed members are subject to Senate confirmation.

Evaluation of the Kansas Technology Enterprise Corporation (KTEC)

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Greenfield, IN
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Prepared for

Kansas, Inc.

April 8, 2009

KTEC
10-7+8-09
Attachment 2

Preface

By statute, Kansas, Inc. has three core missions: economic development strategic planning, research and evaluation. While each component is important on its own merits, when combined as a homogeneous function, the value of Kansas, Inc.'s overall mission can be leveraged to provide fundamental policies and recommendations to ensure the state's ongoing strategic competitiveness for economic growth. The vision of Kansas, Inc., as designed by the Governor and Legislature, is to provide long-term vision and continuity as related to the state's "business plan," in the ever-changing arena defined as economic development.

Over the last several years, Kansas, Inc. has generated numerous research reports on a variety of topics that provided the foundation for the state's subsequent economic development strategic plan. Kansas, Inc. has also completed evaluations of the Kansas Department of Commerce, NetWork Kansas, Kansas Bioscience Authority, and now the Kansas Technology Enterprise Corporation. The methodical process of evaluating state agencies tasked with economic development has provided an understanding of the value brought forth with these initiatives while operating in an environment of limited resources.

Given the complexity of technology-based economic development, Kansas, Inc. designed the scope of this evaluation to be flexible and responsive to the needs of both KTEC and its stakeholders. Through this process, Kansas, Inc. utilized the services of Thomas P. Miller and Associates (TPMA), a nationally recognized firm with a long and rich history of partnering with regions, cities, counties and states in developing sustainable business plans and strategies to execute those plans. Kansas, Inc. commends the efforts of both TPMA and KTEC to provide meaningful information to decision-makers.

This evaluation is not a financial audit of KTEC, rather, a Kansas, Inc. evaluation, by design, provides a holistic assessment of an economic development initiative – intended to capture the overall direction, sustainability and success of an initiative as envisioned by its initializing statute. Thus, the evaluation process produces dynamic input to the complex, interactive process that is government decision-making. This process results in a source of information that can assist the decision-making and management process for resource allocation and program improvement, while providing for overall accountability in government. Based on this premise, this evaluation makes several well-reasoned conclusions and recommendations that should be considered.

Stan Ahlerich
President
Kansas, Inc.

Kansas, Inc. Board of Directors

Created by the Legislature in 1986, Kansas, Inc. is an independent, objective, and non-partisan organization designed to conduct economic development research and analysis with the goal of developing policies and recommendations to ensure the state's ongoing competitiveness for economic growth. To attain our mission, Kansas, Inc. undertakes these primary activities: 1) Identifying, building, and promoting a Strategic Plan for economic development efforts in the State of Kansas; 2) To complement the Strategic Plan, Kansas, Inc. develops and implements a proactive and aggressive research agenda, which is used to identify and promote sound economic development strategies and policies; 3) Through collaboration and outreach with economic development entities and other potential partners, Kansas, Inc. conducts evaluation reviews and provides oversight of economic development programs to benchmark development efforts in the State of Kansas.

Co-Chaired by the Governor, Kansas, Inc. is governed by a 17-member Board of Directors. Board members, as mandated by legislation, include four members of Legislative leadership, a representative from the Board of Regents, the Secretary of Commerce, the Commanding General of the Kansas Cavalry, a representative from labor, and eight other members from the private sector representing key Kansas industrial sectors. Private sector members are appointed by the Governor and confirmed by the Kansas Senate.

Through analysis and open dialogue, Kansas, Inc. identifies policy options and builds the consensus essential for concerted action on vital economic issues. Kansas, Inc. is designed to be a public-private partnership with expectations that state investments are leveraged with other funds to maintain a strong research portfolio.

Co-Chairs

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Debby Fitzhugh
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Foreword

Economic development, under the best of circumstances and during the best of times, is an often-misunderstood concept. The idea of giving taxpayer dollars to seemingly successful, large firms that promise to bring jobs to an area is a hard sell for many citizens and elected officials.

Complicate this misunderstanding of economic development one-hundred fold for 'technology-based economic development' (TBED) where taxpayer dollars are invested in seemingly non-existent companies that may never produce products or jobs and you have the essence of some of the discussions swirling around the Kansas Technology Enterprise Corporation (KTEC).

As the principal standard-bearer for technology-based economic development in Kansas, KTEC has a statutorily defined mission to foster an entrepreneurial business climate that leads to the creation of new, entrepreneurial businesses and the research that supports that creation.

KTEC was created by the Kansas legislature over twenty years ago. During the intervening years, the organization has advanced the technology discussion within Kansas. One can easily make the case, as many stakeholders have during this evaluation that Kansas would not be as far along as it is with respect to technology without the presence of KTEC.

Given that Kansas continues to rank in the bottom quartile of many technology-based rankings, some would conclude that KTEC has failed. Another interpretation of these rankings is that KTEC has helped Kansas maintain its foothold in technology-based economic development while other states have improved their position.

KTEC and Kansas may be at a crossroads with respect to technology-based economic development. Up to this point, the discussion in Kansas has been generally about 'technology' and 'entrepreneurship' and a climate has evolved where any technology and any entrepreneurial activity is viewed as potentially worthy of support.

The states and regions that are moving ahead of Kansas are doing so through careful focus on specific technology clusters, with education aimed at encouraging entrepreneurs to 'get in the game' while also generating political support, and through fostering an organizational infrastructure that appropriately supports the innovation continuum from idea to Initial Public Offering (IPO).

With KTEC's leadership and formation, the Kansas Bioscience Authority (KBA) has emerged to champion one area of focus around life and bioscience technologies. A different model, again with KTEC support and leadership, SITAKS (Software and Information Technology Association of Kansas) has formed around the Wichita area to coalesce software and IT engineers in the aviation industry.

An appropriate role for KTEC going forward is to serve as an identifier and convener of technology clusters where Kansas could emerge as a leader. It may be time for KTEC to evolve beyond a generic definition of 'technology' for Kansas.

Because economic development and technology-based economic development are so often misunderstood and maligned, it is essential that a champion emerge to raise the level of sophistication of stakeholders in Kansas. Often, the argument is made that taking time to explain TBED slows down progress in an area where speed is critical. Yet, progress for TBED in Kansas is periodically derailed by public or political outcries questioning KTEC's motives, process, or both.

Promoting a clearer understanding among elected officials and even KTEC stakeholders such as its own board members may seem to be a time-consuming effort at the beginning, but helps to generate speed of implementation later when a well-informed group of stakeholders begins to contribute positive energy to the TBED agenda.

Finally, as we have begun to see with KBA, specific technology clusters need their own sets of experts and support mechanisms in place to move technology from lab to marketplace. KTEC's role may appropriately be

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one of entrepreneur and technology champion and to take the lead in identifying technology clusters that have potential for pre-eminence in Kansas, to convene stakeholders in those clusters, and then to help those stakeholders organize before getting out of their way.

It may be that its time for the function and operation of KTEC to evolve to the next level in terms of advancing innovation and commercialization in the state. Leadership in the state and on the KTEC board has a responsibility to support focus for KTEC and to elevate it to the next level of sophistication and to establish aggressive yet realistic expectations about what it can and should deliver for Kansas.

During these difficult economic times when states are struggling to make ends meet, economic development activities are a popular cost-cutting target. In the case of KTEC, rolling its function into another organization or eliminating the function altogether would force Kansas to relinquish its place in the 'technology race' and risk falling further behind. Failure to support the specialized talent required to advance technology-based economic development and failure to provide adequate resources will consign Kansas to the back of the technology pack for many years to come.

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Section I: Executive Summary

Thomas P. Miller and Associates (TPMA) was engaged by Kansas, Inc. to conduct an objective evaluation of the Kansas Technology Enterprise Corporation (KTEC). This study completes a series of evaluations on economic development agencies being performed by Kansas, Inc. Evaluations of the Department of Commerce and the Kansas Center for Entrepreneurship (NetWork Kansas) were released in late 2007, the report on the Kansas Bioscience Authority (KBA), in late 2008. The intent of this study is to 1) evaluate KTEC's performance in fulfilling its purpose and mission and 2) examine the fiscal and economic impact of KTEC programs and activities on the state's economy and jobs created. This study attempts to address these two themes by answering the following three questions:

1. Is KTEC adhering to its statutory obligations?
2. Has KTEC initiated its statutorily defined programs and initiatives?
3. What have been the outcomes of the KTEC investments?

This study is not a financial audit. KTEC is audited and monitored regularly by duly qualified financial auditors. This study is a review of the economic development impact and accomplishments of KTEC as an economic development entity within the state of Kansas. Where necessary to evaluate financial aspects of the organization as a matter of performance, accomplishment, or impact on the economic development of the State, it is done so strictly from an observational position and in no way reflects a financial audit of record.

KTEC was created by the Kansas legislature in 1987 "to foster innovation in existing and developing businesses, especially the creation, growth and expansion of Kansas enterprises in a diversified range of primary sectors, which develop value-added products, processes and services including, but not limited to:

1. Existing resource-based industries of agriculture, oil, gas, coal and helium;
2. Existing advanced technology industries of aviation, pharmaceuticals, computers and electronics; and
3. Emerging industries of telecommunications, computer software, information services, and research services[1]."

The evaluation team used a number of qualitative and quantitative sources and techniques to explore KTEC's impact on the economy of Kansas and its compliance with enabling statutes.

The evaluation process included over eighty interviews[2] with select stakeholders of KTEC and included former and current board members, elected officials, state agency representatives, entrepreneurs, university officials, former and current KTEC staff, as well as others. In general, the interviews indicated a broad range of attitudes about KTEC, reflecting diverse opinions. Few interviewed seemed to have a broad grasp of the organization, but rather had a unique perspective based upon his or her direct interaction with KTEC personnel, programs, and resources.

In addition, previous reports, conducted by the Research Triangle Institute (RTI) and the state audit agency (LPA) were examined and analyzed, as were annual reports released by KTEC and Kansas, Inc., and reports from university and other governmental agencies. Data were examined from various national groups and agencies, including the Association of University Technology Managers, the State Science and Technology Institute, the Kauffman Foundation, and others.

TPMA also had access to board books, including minutes from meetings and documentation about company applications for assistance, in addition to an in-person tutorial on the recently implemented software system for tracking client interactions and records. Due to the confidentiality agreement TPMA signed with KTEC prior to

[1] 74-8102; Appendix A: Statutes
[2] See Appendix B: Interview Guide

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reviewing company documents, and the anonymity requested by interviewees, TPMA used publicly available references to validate statements.

Key topics include:

- KTEC's influence to expand the declared role of universities to cover economic development activities
- KTEC's significant participation in the development of the 2004 KEGA legislation and subsequent creation of the Kansas Bioscience Authority
- KTEC's role in recruiting promising technology companies to Kansas (e.g., Deciphera in 2003, Inverseon in 2004, Ventria in 2006, and Edenspace in 2007)
- KTEC's efforts to promote awareness about the importance of technology-based economic development for Kansas
- Successful exits of several Kansas-based companies (realized return on investments)
- Increased interaction among the members and affiliates of the KTEC-technology-based economic development (TBED) community
- Inconsistently, or misleading metrics upon which to gauge performance
- Continued support for organizations based on political or geographic "balance" rather than merit
- Analysis of behavior relative to statutory compliance and best business practices
- Variance in understanding TBED characteristics and KTEC's mission

Common Themes in Interviews

From November 2008 to January 2009, the TPMA team conducted interviews with over 80 stakeholders that included current and former KTEC board members, entrepreneurs who have received and who did not receive funding, state and elected officials, former and current staff members, participants in the Pipeline program and other stakeholders. A copy of the set of questions that were used is included as Appendix B to this report. Interviewees were promised anonymity, so what follows is a compilation of themes derived from the interviews.

KTEC's Role in Kansas

Not everyone seems to have a comprehensive understanding of KTEC. Many interviewees know only the aspect of KTEC that they have directly interacted with (Pipeline, Centers of Excellence, capital) but some do not see the 'big picture.'

One important aspect of KTEC's activities that gets lost in the shuffle is that KTEC has invested in a number of technology-based companies and, in doing so, has contributed to keeping them within the State of Kansas. A number of company executives noted that their companies would have left the state, but KTEC's investment required them to stay.

KTEC has fulfilled a vital function within Kansas by working to connect and network various entrepreneurs, venture capitalists, entrepreneur support organizations and other business support mechanisms. Many interviewees identified KTEC as the 'hub' of the technology network in Kansas.

Among the overriding positive that individuals attribute to KTEC is that it provides a sense of 'one-stop' assistance for entrepreneurs. Because of the expertise of the staff and their extensive network, KTEC has become the place to call for entrepreneur assistance: not that they 'do it all' but that they know whom to call.

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KTEC Board

Many board members who are not members of the Executive Committee or officers expressed they are only allowed to operate in an advisory capacity. Many cited the lack of detailed board information either prior to or during board meetings as a particularly troublesome issue.

A number of comments dealt with the conduct of the board meetings. Some respondents indicated that board meetings seem contrived, i.e., conclusions are pre-defined and there is little or no substantive discussion during the meetings.

Kansas' Technology Clusters

With the emergence of the Kansas Bioscience Authority (administered by KTEC when first established) and the industry trade groups KansasBio and SITAKS (both formed by KTEC) focus on two industry clusters in Kansas has begun to formulate. Otherwise, few interviewees were able to identify KTEC's focus beyond 'technology' and with few isolated examples could not specify areas where Kansas might develop unique intellectual and economic assets. This may be appropriate, i.e., if KTEC operates as the foundation builder and other groups such as KBA emerge to actualize specific industry assets out of the foundation work KTEC has started, but this seems to be a default strategy currently.

'Ag-bio' or some form of agricultural-based technology was cited by a number of interviewees as a potentially unique opportunity for Kansas that KTEC should be taking a leadership role on. Animal health and medicine was cited as an area where Kansas, particularly the Western portion of the state, has some assets that are not being sufficiently exploited.

Some interviewees also expressed optimism that KTEC could become more of a platform for cross-technology collaboration, e.g., ag-bio and green energy, or soy technology and polymers or helping to facilitate cross industry collaborations, i.e., composite materials from aviation with biotech applications.

KTEC Programming

Program participants are almost universally positive about the experience and support they have received through KTEC programs. Pipeline receives very positive reviews from participants. Entrepreneurs who have received the benefit of angel investment tax credits are positive about both the result of the process (capital) but also the process used to validate and vet the business. Receiving a positive endorsement by KTEC, with or without funding as a result, is perceived to be a 'stamp of approval' for venture capitalists.

KTEC Operations

For a variety of reasons, some interviewees referred to KTEC as a 'black box:' this description was used by a finance applicant and a board member, referring to different interactions with KTEC, but referencing the same underlying cause: procedures at KTEC are not transparent to all board members or applicants for funding. While the use of the term "black box" was not universal, more than occasional references were made to difficulties with getting information from KTEC or with understanding how decisions were made within the organization.

KTEC is occasionally criticized for lack of promotion and lack of marketing. This lack is interpreted in a couple of ways: one, KTEC is too busy focusing on its mission to spend time 'self-promoting,' or, two, KTEC leadership is confident enough to believe that they do not have to communicate their activities to outsiders. Either way, lack of information to the general public or even to interested stakeholders unnecessarily creates suspicion and conflict about KTEC's mission and progress.

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Lack of communication was mentioned as a particular problem with respect to the Kansas legislature. While legislators serve on the KTEC board, there is a concern that KTEC staff does not provide extra effort to inform, educate, and explain KTEC's mission and progress to legislators.

KTEC Progress

A majority of interviewees indicated that without KTEC, Kansas' present and future economic prospects would be significantly diminished, particularly in the area of technology-based economic development. There is a general sense that the creation of KTEC has enabled Kansas to get in and stay in the "technology game."

Creation of the Kansas Angel Tax Credit, for which KTEC was a principal champion, is seen as a positive step for Kansas and has provided significant capital for start-up companies in Kansas. The unique structure of the program, a direct tax credit to the angel investor, has served to mobilize new capital in the state.

Few interviewees were able to articulate the success metrics for KTEC or whether KTEC was making measurable progress on specific items. With regard to the 'progress' question, most interviewees indicated their belief that KTEC is making progress in fostering technology business in Kansas, but were often unable to point to specific indicators that are or could be used to measure progress. This creates an opportunity for KTEC to better calibrate its message and make a renewed effort to increase communication to stakeholders.

Likewise, when interviewees were asked to put the mission of KTEC 'in their own words,' almost all were able to articulate KTEC's function of growing technology businesses in Kansas, but could not provide specific examples.

Concern is emerging about whether KTEC is providing appropriate leadership for commercialization of university research. Some interviewees noted that KTEC is well positioned to serve as a convener across universities, yet has not really taken advantage of its position to do so. For example, bringing together expertise in plastics and bioscience could create new break-through technologies. Expertise regarding commercialization is uneven across the universities in the state and the learning curve is steep and expensive. Finding ways to collaborate across universities to share expertise, experience, and even cross-pollinate research is an appropriate role for KTEC.

A number of interviewees raised the rhetorical question about return on investment on start-up companies versus investing the same dollars in attracting or growing existing companies. No one had or has an answer to the question, but many interviewees were grappling with this question, particularly when they could not point to specific tangible outcomes from KTEC. This is typical for technology-based economic development but should be a call to KTEC stakeholders to better track and articulate ROI.

Another theme that comes across from many interviews is that KTEC is perceived as trying to be 'all things to all people.' In this model, there is never enough money to accomplish everything and as a result, some individuals end up being marginally disappointed. The alternative is to focus more exclusively on some defined opportunities and within specific industry sectors to manage expectations over the long haul and direct finite resources to have an impact.

KTEC Structure

A simple organization chart will not describe KTEC adequately. Its enabling statutes did not outline a hierarchical organization, but rather, an agent for promoting change and innovation. KTEC's relatively small staff leverages its relationships with subsidiaries and affiliates across the state to gather and broker information, leverage state investment in TBED with external funding opportunities to match entrepreneurs and researchers, and to encourage the forward progress of commercialization projects.

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Innovation Phase I – Idea and Product Formation

University Programs

As envisioned by statutes, KTEC supports (or has helped establish) university-based Centers of Excellence. Not all Centers of Excellence perform equally well. The high-performing centers show a pattern of increased contribution from private industry as a percentage of operating budgets, making KTEC's financial participation marginally significant. As an example, the National Institute for Aviation Research (NIAR), based at Wichita State University, receives 41 percent of its operating budget ($35.9 million in 2008) from private industry. According to the State Science and Technology Institute (SSTI) 2006 publication[3], "A Resource Guide for Technology-Based Economic Development," (created under the aegis of the U.S. Department of Commerce) early university-based centers typically required a 1:1 match of private to public money. At the time of the 2006 SSTI report, that performance benchmark had moved to 3:1 or 4:1. With another 37 percent of its operating budget coming from federal grants, NIAR performs at the high end for centers of excellence in the U.S..

A determination should be made about how to address underperforming centers. At some point, a decision must be made about whether to continue funding that center, redesign the center to make it more multi-disciplinary or relevant to attract federal funding, or withdraw funding altogether. The latter option should not be construed as "punishment." Withdrawn funds would be redistributed, perhaps to start a new center in a technology area that has more traction.

Another important component of KTEC's university programs is grant making or matching. Through the federal Experimental Program to Stimulate Competitive Research (EPSCoR) and Kansas Strategic Technologies and Research (STAR) Fund, KTEC channels state dollars to support university proposals that require state contributions. The STAR Fund projects tend to have a much higher leverage ratio (federal plus industry to state dollars) than do EPSCoR projects. The pattern of leverage ratios for EPSCoR projects is encouraging since 2001. Between 1995 and 2000, the leverage ratio ranged from 1:1 to a high of 1.7:1. Beginning in 2001, that ratio ranged from 2.7:1 to 9.5:1. That trend may reflect proposals that are increasingly multi-disciplinary and multi-institutional. Encouraging that kind of cross-fertilization, both in terms of research content and research relationships, is one of the most significant roles KTEC can play to create an innovation engine in Kansas.

Innovation Phase II – Business Formation

Incubators and Entrepreneurs

Business incubators also play a role in taking intellectual property (IP), often developed at a university, to the commercialization launch point. Business assistance incubator program activities typically enter the innovation life cycle at the commercialization stage. Although resources associated with the incubator programs are typically based in university towns, on-campus, and have close ties with university personnel, the client population is more heavily skewed toward non-academic entrepreneurs.

KTEC gives financial support to eight business incubators. In addition to the incubators, the Mid-America Manufacturing Technology Center (MAMTC), a wholly owned subsidiary, also receives annual funding from the federal National Institute of Standards and Technology (NIST) to fulfill the role of Manufacturing Extension Partner solely focused on improving the competitiveness of small- and medium-sized manufacturing enterprises.

This financial support relationship has evolved into a more multi-directional networking and information-sharing model. KTEC and business incubator staff benefit from regularly scheduled conference calls with center of excellence staff to discuss emerging opportunities in research, companies, resources, market need, and funding. These monthly calls are enhanced through Intranet postings. As with the centers of excellence, not all business incubators perform at equally high levels. Again, according to the best practices cited by SSTI, business

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[3] 2006 data, published in 2008, is the most current available data

incubators should not exist solely to provide discount real estate for any small business. Based on interviews SSTI performed on behalf of the U.S. Department of Commerce: "an incubator should only be created if a clear need, a sufficient market, and adequate resources to support the incubator have first been identified."[4]

The KTEC Pipeline program is entering its third year. A unique program in the U.S., its purpose is to create a network for innovation-based entrepreneurs in Kansas. A core feature of the program is to formulate a 'class' of entrepreneurs and innovators through a series of formal and informal sessions to learn more about the business side of product commercialization and capital financing.

A self-admittedly long-term process, it is difficult to project its future impact. Success should identify outcomes rather than activities and be counted appropriately.

For example, four of the six investments made by KTEC in 2008 went to Pipeline program participants. The statement can be made that four of the Pipeline participants successful raised risk capital, but if KTEC is the only source for that capital, the measurement is an indication of program activity – not program performance.

In cases where the Pipeline participants received KTEC funding before 2004, Pipeline participation by senior management may serve to protect and optimize that earlier investment of state funds. The proposed 2009 program budget of $437,000 is approximately one-third that proposed for equity investment in companies. While this is a significant use of KTEC resources, the development of an active support structure for innovation-based entrepreneurism is one key component of the regions TBED structure. The proposed 2009 program budget is approximately one-third of that proposed for equity investment in companies. This is a significant use of KTEC resources.

The Pipeline program joins other entrepreneurship programs in and around the state, some of which are university-based and others foundation-based. The Ewing Marion Kauffman Foundation, for example, announced in February 2009 its $1,000,000 initiative to offer FastTrac Launch Pad training programs to communities across the U.S. The networking potential through the Kauffman program dwarfs any other: 300,000 entrepreneurs have graduated since 1993. Leveraging this and other programs through scholarship programs may be a reasonable alternative to a KTEC-branded entrepreneurship program.

Pipeline is being touted nationally – included by the Kauffman Foundation, which Pipeline consults with on a regular basis (along with consulting with FastTrac executives and national thought leaders).

Innovation Phase III – Capital Formation

Equity Investment and Angel Tax Credit Programs

According to statute, KTEC should play a significant role in capital formation at the seed stage. KTEC's strategy for funding companies has evolved over the years: from loans and grants to royalty and equity positions. The types of companies targeted have also evolved over the years. Because there is no liquid market for the investments that make up KTEC's portfolio, companies remain in that portfolio until the company terminates operations or exits via trade sale or acquisition, IPO, or liquidation of assets. KTEC's portfolio as of March 2009 stood at $9.147 million, with 45 active companies in which KTEC made investments between 2002 and December 2008. Over KTEC's investment lifetime, another 13 companies that have terminated operations received a total of $2.15 million and three companies exited successfully (realized return on investments).

According to a study performed for the Kauffman Foundation,[5] a typical angel investor with a portfolio of ten seed/startup companies hopes that three or four of the companies will return some, perhaps a modest, return on capital and that another three or four will, in effect, return the capital for all ten. Angel investors expect that half will terminate operations without return to investors. KTEC's portfolio has shown some solid returns – from

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[4] SSTI, page 43.
[5] Luis Villalobos and William H. (Bill) Payne, "Valuing Pre-Revenue Companies," July 1, 2007.

Knowledge Communications and AeroComm. The most notable losses as of February 2009 are QuVis ($252,000 invested) and Kozoru ($667,000 invested) and Neurovision ($250,000 invested). An in-depth look at these and other companies appears in the section on case studies.

KTEC makes investments through two State-funded instruments: Applied Research Matching Fund (ARMF) and Technology Commercialization Seed Fund (TCSF – established 2003). Between 1988 and 2006, the number of companies receiving financial assistance in a single year has ranged from a low of 9 (2006) to a high of 41 (1992). Beginning in 2002, the number of investments per year has not exceeded 13 companies. Earnings realized through KTEC's wholly owned subsidiary, KTEC Holdings, are used to augment these investment funds.

The total of investment activities during this time is $22.47 million and recorded industry matches total $78.73 million. One of the metrics used by KTEC to describe its impact on the Kansas economy from 1988 through 2006 is the average leverage ratio (industry investment to KTEC investment). Due to superb leverage figures for 2006, the "average leverage" is computed as 3.5:1. Based on that metric, investments performed under average for 17 of the 19 years (2004 and 2006 are the exceptions). A trend analysis would be a more reliable method of defining a benchmark for the investment leverage ratio. The mean leverage ratio is 1.9:1.

Kansas legislators may be asking the wrong question when they request Return on Investment (ROI) calculations for KTEC investments in companies. Greater clarity is needed around the role that KTEC should play in the innovation/commercialization lifecycle.

As discussed earlier, there is no market for the investments in the portfolio – they cannot be sold, as can stock market investments, for example. If the focus is strictly on financial return to the State, investments can be made in companies that are further along in the commercialization process. This means, of course, that the equity position for the State (as represented by KTEC) will be less, as will the potential for influencing management decisions or even negotiating commitment to the terms of the compliance agreement for assistance recipients. Such investment may represent a higher risk profile – the technology may be ahead of market timing or ahead of its own time – at a very early pre-proof-of-concept stage of development. The statutes seem to prescribe this emphasis for KTEC.

The investment decision-making process has become more transparent and consistent, perhaps because of expertise acquired by the KTEC Board Investment Committee, reduction in staff churn, improved investment tracking and documentation, as well as communications that are more open.

As part of the 2004 Kansas Economic Growth Act (KEGA) legislation, KTEC was designated administrator for the newly created Angel Investor Tax Credit program. It has qualified 67 companies under this program that encourages capital formation by reducing risk to investors.

Innovation Phase IV – Launch

Success Measurements and Benchmarks
Recommendations and Conclusions

The primary objective of this study was to evaluate KTEC's success in fulfilling its purpose: "to foster innovation in existing and developing businesses, especially the creation, growth and expansion of Kansas enterprises in a diversified range of primary sectors, which develop value-added products, processes and services."[6] TPMA used both the State Science and Technology Institute (SSTI) and the State New Economy Index reference models to guide its evaluation of program outcomes. Specifically, TPMA looked at:

- Intellectual infrastructure, i.e., universities and public or private research laboratories that generate new knowledge and discoveries
- Mechanisms for transferring knowledge from one individual to another or from one company to another

[6] K.S.A. 74-8102

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- Risk capital formation

TPMA also compared Kansas' performance with a set of states that have been used in previous studies: Arkansas, Arizona, Colorado, Iowa, Missouri, Mississippi, Nebraska, and Oklahoma. Because Kansas' strength in certain niche life sciences technologies is similar to Indiana's – and because individual TPMA team members participated significantly in Indiana's life sciences technology cluster activities – this report also includes a discussion of Indiana's experiences.

TPMA has attempted to highlight in its conclusions key topics for discussion, rather than make policy recommendations. When asked, many interviewees stated, "KTEC's programs are good for the State of Kansas." When asked for further elaboration, however, few could effectively describe such programs, or effectively and completely describe a mission for KTEC other than "driving the technology economy growth of Kansas." Other interviewees stated exactly the opposite, that KTEC was not fulfilling some of the above identical roles. This study is an attempt to reconcile these differences by observing and reporting what is working and what is not. TPMA's summary conclusions fall along several key dimensions:

- Kansas needs a focal point for entrepreneurs and innovators.
  - Many individuals that were interviewed for this project cannot imagine Kansas having an entrepreneurial presence without KTEC. They indicated that KTEC is the hub of the entrepreneurial network in the state.
  - KTEC has been successful in enhancing entrepreneurial business climate in Kansas but could do more to establish networking opportunities among entrepreneurs and technologists, by actively promoting Kansas' assets to venture capitalists, and by actively creating multiple 'front doors' where entrepreneurs can easily access support
  - While KTEC has served as a catalyst for inter-university collaboration, it could be more actively engaged in convening multiple universities to facilitate cross-technology innovation and to facilitate actively commercialization of university research by sponsoring and facilitating seminars that bring together researchers from universities that have complimentary technologies or that highlight multiple research projects within specific technologies.
- KTEC needs a clear vision of its role in building a successful Kansas economy.
  - The KTEC model as originally envisioned is solid. The current execution of the model, however, could be updated and evolved to a clearer focus on specific technologies where Kansas has the opportunity to excel.
  - The qualitative difference that KTEC has made by building capacity for shared intellectual discovery and business assistance is difficult to measure. It is where the real impact is being made.
  - KTEC may be guilty of compulsively branding itself. KTEC should not unnecessarily promote itself but promote the Kansas entrepreneurial climate and legitimate successes.
  - KTEC does not have an operational definition of 'technology-based economic development' to guide its investment decisions and programs.
  - The board of directors may be less engaged than is envisioned in the enabling statutes.
  - KTEC's portfolio could be more focused. 'Technology' is too broad a focus for KTEC, the Kansas Bioscience Authority has been created by KTEC to concentrate on bioscience technology, and other technology platforms may be falling through the cracks due to insufficient attention. KTEC should look for concentrations of emerging technology and focus on areas where Kansas can develop a leadership role.

Other recommendations include:

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- During these difficult economic times when states are struggling to make ends meet, economic development activities are a popular cost-cutting target. In the case of KTEC, rolling its function into another organization or eliminating the function altogether would force Kansas to relinquish its place in the 'technology race' and risk falling further behind. Failure to support the specialized talent required to advance technology-based economic development and failure to provide adequate resources will consign Kansas to the back of the technology pack for many years to come.
- KTEC should continue to identify unique technology clusters in Kansas around which the innovation economy can be built. Some interviewees identified animal health, embedded systems, and plastics as potential opportunities.
- KTEC needs to establish a clear and uniform set of metrics, collect and maintain information that supports these metrics, and regularly report progress. Metrics should reflect outcomes rather than activities.
- KTEC could better serve its stakeholders and foster a more entrepreneurial culture in Kansas by posting all annual reports, schedules, minutes, etc. online, as would providing more materials to board members in advance of meetings.
- KTEC needs mechanisms in place to assure that the Board of Directors is fulfilling its fiduciary role and is operating in accordance to statute. Encourage Board members and their delegates (e.g., members of the Board Investment Committee) to take a more active role in decision-making. For example, investment recommendations could be presented by an Investment Committee member, rather than by KTEC staff. The committee is responsible for making the recommendation; KTEC staff is responsible for managing the process and providing information and analytical support as requested by the Board.
- Provide thorough and adequate information to the Board well in advance of board meetings to enable them to make appropriately informed decisions. Board members must be informed to be able to fulfill their statutory duties.
- Maintain the integrity of the Board nomination and selection process.
- Build Board capacity to ensure that entrepreneurs, technology experts, intellectual property attorneys, and financial experts are represented on the board. Structure the board with at least one entrepreneur who never has (and probably never will) go to KTEC for funding. Implement a rotation system for the Investment Committee so that expertise is developed and concerns about closed group decision-making are allayed. Consider downsizing the board and create a Governor's Technology Roundtable that meets the political needs for balance.
- A determination should be made about how to address underperforming centers of excellence. KTEC should properly consider whether to continue funding an underperforming center, redesign the center to make it more multi-disciplinary or relevant to attract federal funding, or consider withdrawing funding altogether. The latter option should not be construed as "punishment." Withdrawn funds would be redistributed, perhaps to start a new center in a technology area that has more traction.
- Work with existing companies to identify "orphan" technologies and identify employee mentors/interns/students that could develop them to the proof-of-concept stage.
- Leverage existing entrepreneurship programs and consider extending the Pipeline brand to meet needs of entrepreneurs at different stages of development.

Generally, this report overviews the KTEC model – as proposed and as executed – and makes conclusions and recommendations. There are many positives about the KTEC model, and the current KTEC programs. There are areas where the execution of the KTEC model is not fulfilling the intent of the original model or the statute, areas in which the statutes do not fit with what works, and areas where improvements can be made.

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Section II: Evaluation of Previous Reports

The evaluation team was tasked, as part of the original design and scope of the project, with reviewing previous reports as a way of evaluating their applicability to the current assessment and assuring that appropriate recommendations are carried forward.

Legislative Post Audit Report 2008

Economic Development: Determining the Amounts the State Has Spent on Economic Development Programs and the Economic Impacts on Kansas Counties (LPA, 2008)

Report Description

This report, prepared for the Legislative Post Audit Committee by the Legislative Division of Post Audit attempted to address three basic questions:

- Question #1: How much State, Federal, and Local money has been spent on economic development programs during the last five years?
- Question #2: What have past audits and studies shown about the effectiveness of economic development programs?
- Question #3: What conclusions can be drawn about the effectiveness of economic development expenditures?

Summary of Report Findings

A significant challenge encountered by the LPA in the creation of this report was to develop a functional definition of 'economic development' that would sufficiently define activities at the state and local levels and facilitate a clear demarcation of direct expenditures and foregone tax revenues. The definition used for the report was 'activities whose primary purpose is to stimulate the Kansas economy, expand or maintain employment opportunities within the State, or encourage the establishment and growth of commerce and industry in the State.'

Within this very broad definition, LPA indicated that the 'revised estimated cost of economic development in Kansas during the fiscal years 2003 through 2007 is at least $1.3 billion, which includes both governmental spending and forgone tax revenues.' The report identifies expenditures made by several groups and then points out that 49 percent of that money came from the State of Kansas. Of the amount identified, $453 million was 'spent' by the State and local governments, while waived tax revenues accounted for $860 million. LPA projected that another economic development enticement repeal of the Business and Machinery Property Tax could add an additional $404 million to the overall amount. As listed in the report, the actual total economic development expenditures of state funds by all state economic development organizations over the five year period was $224 million, with $58.6 million of that coming from KTEC.

Data collected were primarily from five state agencies: Department of Commerce, Kansas Technology Enterprise Corporation, Kansas Bioscience Authority, Kansas SBDC, and Kansas, Inc. For 'foregone revenue', LPA used Department of Revenue data and Department of Commerce data for tax abatements, industrial revenue bond exemptions, STAR bonds, and similar programs. The LPA report noted that data were often incomplete for income tax credits, but accepted reported figures while noting inconsistencies with other data.

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Data were collected for one year on selected communities in an effort to provide representative information about local spending and impact. The limitations of the data collected are noted and while some summary statements are included about specific counties, the report concludes that no sustaining conclusions could be drawn from the data.

The impact of cash payments to companies was considered, including investments in start-ups, grants for job creation, employee training and development, and other such payments. Three of five agencies reported making these payments in amounts that increased from 2003 to 2007. No conclusions about these payments were reached as part of the report and no correlation was reported between the expenditures made and any intended outcomes.

LPA reports tax revenue that has been 'displaced' due to economic development efforts. LPA notes that proponents of economic development presented arguments that projects would not occur without incentives and that any tax revenues ultimately realized from new or expanding companies should be viewed as 'new' revenues.

LPA does not engage in the speculative nature of this discussion, but reports data by county. Reports are ultimately hampered by the different data collection methods in various counties and localities.

Economic Development Program Effectiveness

LPA notes in this section of the report that economic development is deployed in many forms. A survey of academic research on economic development was included in an attempt to resolve disparities between various types of economic development and efforts to measure their impact.

LPA notes that data collection is often erratic, variable, and skewed and that reports are often quantitative but not qualitative in assessing the adequacy of economic development programs. The report also notes that economic development efforts sometimes take many, many years to show demonstrative results and that even if and when results become apparent, it is difficult to tie results back to the original program.

Overall, the LPA report begins to make some value judgments, noting that in their analysis of Kansas economic development programs:

- promised jobs were not created;
- return on investment is often low or negative; and,
- Incentives offered to companies were not the determining factor for relocations.

Conclusions and Summary

In its final analysis, LPA points out the inherent shortcomings in the report – the data available for analysis is sparse, often vague, incomplete, duplicative, and often lead to mixed conclusions.

Other than the collection of data, and the reporting of a collection of various 'facts and opinions,' one must be careful not to infer too much from the LPA report. No definite conclusion can be made about the performance of specific economic development agencies or about the general progress of support programs. If anything, the report calls into question the spending on behalf of the Department of Commerce that accounts for the highest amount of State expenditures for economic development.

Evaluator's Observations

The real issue raised through the review of this report was whether anyone can truly measure the impact of economic development spending in Kansas. The questions remain: are there more jobs as a result of economic development spending? Is there a better entrepreneurial climate? And, have more companies been retained? Would Kansas see the same result if half the money had been spent or would the state see twice the results if the spending were to be doubled? In the final analysis, LPA makes the only conclusion it can based upon the

scattered data available: KTEC and all parties must keep accurate and complete records, they must include summary data about companies they assist, and they must report data regularly to their sponsoring agencies.

RTI Report 2008

"Evaluation of KTEC Programs: Final Report" – Dated February 15, 2008, RTI Project No. 0211453.001

Executive Summary

KTEC operates highly effective programs that are well focused and meeting client needs. Compared to other states, its funding levels are lower and have remained relatively flat. Additional resources for technology-based economic development would enable KTEC to bring more of its programs to scale to meet the broader technology and innovation needs of Kansas. KTEC should particularly focus on ways to increase venture capital and business start-up activity in Kansas leveraging the success of KTEC's Pipeline program and Business Assistance Centers.

This was the overall finding of the RTI report. There were three essential conclusions, as well, each of which will be addressed individually in this analysis. In addition, RTI made recommendations for several strategies, which will be addressed as well. One of the principle issues with the RTI report is "what was it commissioned to accomplish and why was it commissioned?" Essentially the RTI report (as it will be referred to throughout this assessment) was a "benchmarking effort"; RTI was employed by KTEC to conduct an evaluation of KTEC's programs to determine the effectiveness of these programs. RTI also conducted extensive in-state interviews with key constituents of KTEC's programs to determine the effectiveness of KTEC program execution and the overall "effect of KTEC on the Kansas economy." RTI also interviewed out-of-state Technology-based Economic Development (TBED) officials to compare KTEC's TBED efforts with other state and national TBED efforts.

As mentioned above, the overall conclusions were, to put it simply, that KTEC was under-funded compared to surrounding states; KTEC's programs were effective and satisfactory to most individuals who were interviewed; KTEC needed to improve communications and "raise awareness"; KTEC should be the recipient of more venture capital; and, to quote, "RTI found little room for KTEC to improve its performance management process".

RTI conducted a thorough process, and interviewed many key constituents who play a key role in KTEC's functions and operations. RTI produced some excellent data, as well, from national and regional evaluations. RTI also produced some excellent solutions and recommendations regarding ideas and concepts for future direction for KTEC and for the State of Kansas. However, many of the suggestions and recommendations made are "non-measurable" ideas – improving communications; "expanding image and awareness through a broader public relations and media strategy"; increasing efforts with state editorial boards; enhancing e-communication channels; branding efforts; mining technologies or increasing the level of industry R&D; raising awareness in universities about the benefits of entrepreneurial activity; and so on.

There were also many suggestions for new concepts, but again, there was no explanation of "how" to execute these concepts and provide measurable results over time (i.e. setting up advisory teams – venture "catalysts" – to each company; create incentives for companies to team with local universities; increase the effectiveness of the Centers of Excellence, especially their contributions to the state's business and industry). Perhaps some of these concepts could be elaborated on to provide specific directions and plans for evaluations of results.

For the rest of this review, individual portions of the RTI report will be analyzed and their overall impact on Kansas economic development efforts will be evaluated, as a whole, and on KTEC and its functions. RTI has provided valuable functional information, and an excellent comparison to other states; the true value will be in determining the application value of what can be accomplished and measured. As will be shown throughout

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this summary, the final analysis will reveal the real strength of this report is in the data that are given; RTI does an excellent job of providing a wide range of valuable data for KTEC to consider for future planning. However, the interpretation of those data, relative to future direction, should be looked at in light of specific concepts that can be measured in terms of results, rather than generalities that are "great ideas."

Part 1 – Introduction and Methodology

The introduction describes KTEC, RTI and the initial engagement. The methodology discusses a "three-phase" process of interviews, data analysis, and benchmarking followed by a compilation with recommendations.

Phase 1, which included KTEC Program Assessment, was conducted according to criteria aligned with the State Science and Technology Institute (SSTI). Extensive interviews were conducted with key stakeholders across Kansas to evaluate the extent to which KTEC has accomplished three key objectives: 1) KTEC has enhanced the innovation and research capacity of the state to encourage a pipeline of new businesses and products; 2) KTEC has accelerated the growth of science and technology-based businesses; and 3) KTEC has contributed to the diversification of the Kansas economy.

Phase 2 of this part of the study was a benchmark with other states (six peer states) to compare Kansas efforts against those states. National and regional TBED figures were interviewed for this phase. The goals of this phase were: 1) to determine if the Kansas economy has benefited from the investment in KTEC and its various programs; 2) understand emerging trends in TBED practice and their implications for KTEC; 3) identify new and innovative approaches developed elsewhere that offer potential for application in Kansas.

Phase 3 of this report included recommendations and a final report.

Analysis

It is not possible to evaluate the methodology employed in this evaluation without knowing what the criteria for evaluation were; there are no guidelines described for the report (nor Request for Proposal outline), thus there are no initial templates stated for evaluation. One can only assume RTI had a "premise" for their methodology as stated in their three-point criteria for evaluation. Those questions are valid, but extremely broad, and must be broken down into more specific areas (some of which is done later in this report).

Comparisons and benchmarking studies are always useful, but must always be taken in context; other states have other variables, including the presence of industries, venture capital, geographic capital, university research, federal assistance, nationally prominent inventors/scholars, larger numbers of members of the National Academy of Sciences, and, most important, much longer TBED histories. These are just a few of the "intrinsic" variables not often taken into account when comparing state-to-state TBED activity. Thus, there is a tendency to do an "apples to oranges" comparison which is misleading to the state in question, and the comparison often points to a single solution (often, dollars) which in fact cannot solve the challenge of being behind other states' TBED activity.

The overall goals of this section were extremely broad, but, as with the key points, were broken down within the study.

Part 2 – KTEC and the Kansas Innovation Ecosystem

RTI provides an excellent summary of the Kansas economy and a valuable statistical view of some of the key points of the Kansas economic climate.

Some of the "conclusions" in this section bear close examination. For instance, on page 8, at the end of the first paragraph, it states, "Thus, Kansas has a firm base in training future researchers and scientists that may become entrepreneurs." This is not based in fact; it should be stated as a "perhaps" statement. This statement is based on a previous notation, which states, "Kansas is also consistently ranked in the top 10 states for graduating science and engineering students relative to the state's population." The key questions to ask here are: do a high percentage of these students stay within the state after graduation? Do they go into the workforce

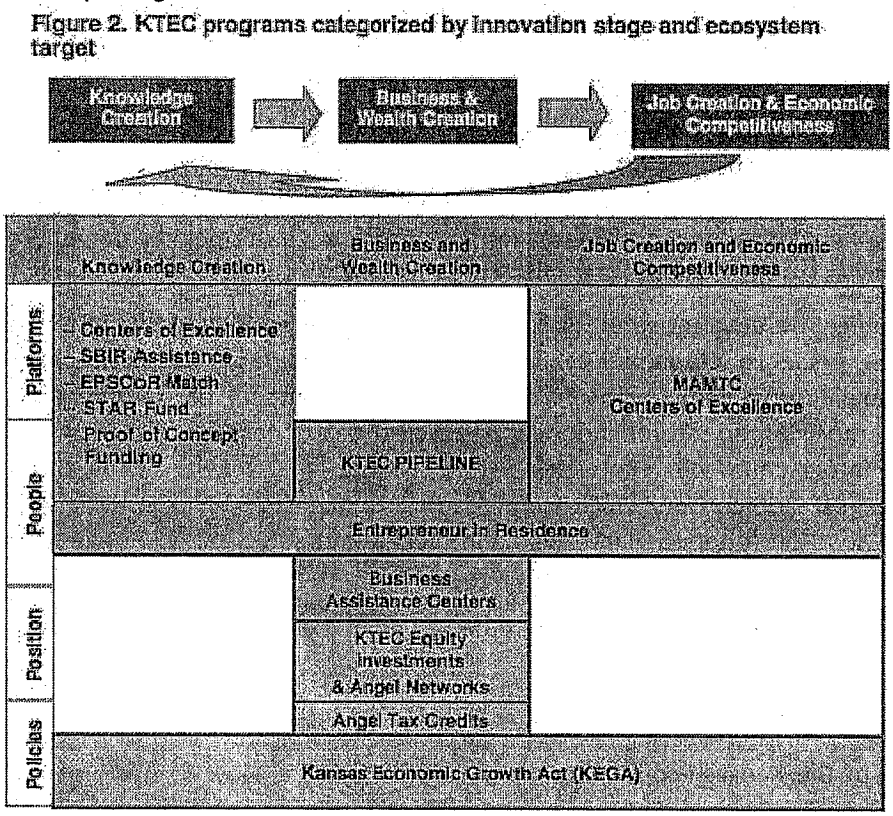
working for large businesses (over 500 employees) or do they go to work for small businesses (under 500 employees)? What percentage goes into the workforce in their area of scholarship (science and engineering)? How many of them actually become entrepreneurial? No survey work on these questions has been done, thus it is a faulty conclusion to state that "Kansas has a firm base in training future researchers and scientists that may become entrepreneurs" – the statement in itself may be true, but one should not take it literally, to avoid being mislead.

Other key facts pointed out are very pertinent, and very well done. One area of caution is in measuring patent output. While certainly patent statistics are held up as a key measure of R&D activity, and patent output is reflective of creation of intellectual property, too often, patent output is looked at as a key measure of success by itself. Many universities and companies generate copious amounts of patents only to continue to have low figures for income and low figures for start-up company creation. It must be remembered that patents are often obtained by a researcher but the intellectual property on which the patent is based is not commercial material, therefore the patent is essentially worthless in terms of TBED.

The rest of this section contains very valuable information regarding the Kansas economy and the current state of economic development in Kansas.

The 'summary of KTEC' portion of the report was surprisingly brief and generic, and mostly spoke about TBED in general, using the term "ecosystem" frequently, and summarizing KTEC in a figure (Figure 1 below). KTEC was summarized as focusing its efforts primarily on the "people" segment of TBED

Figure 1: RTI Report Figure 2



SBIR: Small Business Innovation Research
STAR: Strategic Technology and Research Fund
MAMTC: Mid-America Manufacturing Technology Center
* Program was previously referred to as the Applied Research Matching Fund program.

Part 3 – Internal Findings

In this section, RTI listed results of their interview process (fifty stakeholders were interviewed). Under 'Effectiveness', they stated KTEC offered assistance to other organizations and gave specific examples. They also

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indicated all interviewees responded positively about KTEC programs. It is key here that they listed areas of focus that could help KTEC achieve greater impact – Page fifteen, paragraph three probably has some of the best points in the entire study for KTEC to consider.

The Organization section seemed vague. Here, in particular, RTI contradicts later recommendations. At one point, the report asserts that KTEC is excellent at communications and states that 'it is remarkable that communication among partners is so high,' but later indicates that communications efforts need to improve. The contradiction is further reinforced when RTI cites stakeholders outside of Kansas who fault KTEC for not having better communication about Kansas' progress to audiences outside the state.

Funding is mentioned repeatedly in this report, many times, and here it is pointed out that KTEC funding has decreased over the years, especially compared to other states.

KTEC is praised for high quality programs according to RTI. As with many states, a focus on life sciences and IT is recommended, as is a focus on obtaining more venture capital.

There was a short paragraph about the controversy with KTEC offering bonuses to staff, and a notation that the process is being discontinued as noted in KTEC's 2007 report.

Part 4 – Benchmark Findings

In this data section, the following questions need to be asked as a result of being shown the excellent datasets within:

1. Total R&D per capita – Kansas is one of three states in the peer set to have steadily rising R&D growth on a per capita basis during the period 2002-2004. Has this trend continued, can we estimate that? Is it still rising? What does this mean for Kansas?
2. Industry investment in R&D – Again, positive trends for Kansas – 2002-2004. Again, has it continued? What does it mean? Does this translate to anything positive in entrepreneurism?
3. SBIR/STTR awards per 10,000 establishments – Kansas is near the bottom. We know this shows a lot about entrepreneurism (SBIR awards) – what is the distribution of Phase 1/Phase 2 awards? How can Kansas improve this?
4. University licensing income – Kansas is near the bottom. Invention disclosure trends would be a much better indicator of activity. Licensing income represents a three-to-five year lag time, and is usually representative of one large license (over $10MM). Current Association of University Technology Managers (AUTM) data (2006 survey) shows this relationship between invention disclosure and licensing income to be consistent with other states.
5. University licensing income as a percentage of research expenditures – this is a meaningless measurement – does not change the picture at all. Again, invention disclosure rates would be a more significant data point: however, licensing income, according to AUTM surveys, places Kansas near the bottom.
6. University start-ups – a valuable measurement in a way, but are these companies still in business? How many of these companies are "real" versus "virtual"? Current AUTM survey data show virtually zero university-based start-ups in Kansas (2006 AUTM survey).
7. Entrepreneurial Activity – this is a strange measurement. Would not franchises skew the graph? They already admit lifestyle businesses are included – that skews the results of the graph, and it is unclear what these data show.
8. High-Tech Jobs – Excellent data; it would be nice to see what it would look like if Aviation were added to it.

9. Venture Capital as a Share of Worker Earnings – Isn't this partially a function of the economy, as well? How does that skew the data? Are angel investments included?
10. New company creation – This goes back to the reasoning behind number 7 – this is simply registrations in the state being referenced. This can be franchises, lifestyle businesses, fictitious name, etc. It is valuable because it shows activity, but one must be careful not to relate this directly to entrepreneurism.
11. Gazelle jobs – this graph simply shows that Kansas is following national trends and it experiences highs and lows from year to year.
12. Percent of workforce in Science and Engineering occupations – Again, not sure what these data show for Kansas. Kansas is ranked fourth – does this mean a high percentage of science and engineering graduates in Kansas are leaving the state for employment elsewhere? Is this inadvertently what they are showing?
13. Advanced S&E Degrees as a share of S&E Degrees conferred – Kansas is third – again, what does this show about the "brain drain" in Kansas? Kansas is third for degrees conferred, but this is meaningless if all the graduates leave.
14. Bachelor's Degree Holders as Share of Workforce – Kansas leads the group. So what does this mean for entrepreneurism? It is a good sign, obviously, if it includes farming/non-farming/etc. groups, but what does this really show us?

Overall conclusions – There are some generic conclusions about the base of college graduates. Certainly, that is a very good thing, if the "brain drain" can be or is being prevented.

Use of SBIR/STTR funding for development and commercializing technologies – this is absolutely a key area to examine for KTEC and for Kansas. Developing a statewide SBIR/STTR program to educate and mobilize companies to prepare and submit increased numbers of SBIR/STTR grant applications will greatly enhance opportunities for Kansas companies to achieve success.

Leveraging universities – pulling more technologies out of Kansas Universities, could result in increased licensing and start-up activities. The technology transfer offices at universities are wholly dependent on the faculty for technologies. However, increased focus on early communication with researchers can result in identifying opportunities at better rates in some circumstances, where technology transfer offices have not been as strong at identifying potential intellectual property.

In the benchmarking section, the primary point made is about funding in Kansas being relatively flat over the years. Other states have poured various amounts of money (Oklahoma, in particular, vast amounts) into TBED but Kansas has not increased funding. *Several graphs are shown and the point is made that it is difficult to show an actual comparison because the data is "difficult to compare because each state defines "spending" and "technology-based economic development programs" differently.*

Part 5 – Strategic Direction

RTI identified seven strategy areas for KTEC to consider. They included:

1. Technical Assistance for Business Development (Program Level) – this included excellent advice on business assistance centers, e.g. to include offering advisory teams, establishing milestones for companies with quarterly reviews, consulting by managers of the BAC's, and providing webcasts and training sessions. By examining KTEC's annual reports and website it would appear that much of this is already being provided. RTI also mentions seeking grants for student entrepreneurs, having networking events, and "staying involved with clients after they graduate." These goals were a bit vague and had no specific means for being accomplished or being measured.

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2. Venture Capital/Later-Stage Capital – Goals were stated as efforts to increase the development of commercial technologies through increasing funding, increasing access to seed/pre-seed funding, and increasing the availability of venture stage funding. There were suggestions for programs (create incentives for companies to team with local universities, have a payback mechanism for projects that are successful, target industry sectors, etc.) but again, there were no specific means for accomplishing these items and no ways to measure success of implementing these efforts.

   If indeed, all of these 'suggestions' were implemented, how exactly would 'success' of the implementation (per dollar cost of implementing) be measured? SBIR/STTR funding was addressed, in particular, state matching funds was mentioned; this is an excellent program and can be easily measured as to success rate. A fund-of-funds model is also mentioned; this could be easily tracked as a success measure, as can investment tax credits. These are all effective measures that can be easily tracked and quantified, but will require funding and investment from some source.

3. KTEC Centers of Excellence Funding Models – the Centers of Excellence model is defined as functioning in other states. However, again, this model is subjective and difficult to quantify in terms of success; it is a "long-term" model and takes years to mature and effect change. It is not clear how a Centers of Excellence model will effect positive change in Kansas and what degree of change it will affect, or how that degree of change can/will be measured.

4. University's Role in TBED – The standard measurements of licensed technologies, number of start-ups, patents, and graduates in the sciences are mentioned here. In addition, the usual efforts to "recruit more entrepreneurial faculty" (like every other institution in America) and "influence administration" and "create an entrepreneurial environment" are mentioned. While it is true that creating an environment for entrepreneurism at the University is valuable to long-term efforts, again, quantifying those efforts is impossible. No mention is made of utilizing the business schools at Kansas institutions of higher learning; every effort should be made to use the power of the existing entrepreneurial resources at University business schools to influence the entrepreneurial landscape. Technology transfer "is what it is" and while indications are made that programs may be "streamlined" and improved, little evidence exists that such improvements result in spectacular changes in licensing revenue or patent production.

5. Performance measurement – this is a key area, yet RTI states clearly, *"With a few exceptions, RTI found little room for KTEC to improve its performance management process."* There is nothing in this section of value, just generic observation on items that cannot be measured and general recommendations on reports and communications items, which are reflected generally in KTEC's annual reports, and on KTEC's website.

6. Communications, Marketing, Branding – again, more generic recommendations on communications efforts that cannot be measured and cannot be evaluated as to impact or results. There are significant recommendations here for public relations and "e-communications" which will require significant expenditure of funds. There is no mention of what impact, if any, this will have on entrepreneurism in Kansas or on KTEC's overall success in Kansas. This is all in the category of "general sustaining information," which could be given to any organization wishing to establish itself in the public eye.

7. Engagement with Larger/Established Technology Businesses – this section makes valid points about TBED relative to interfacing with larger established companies, assuming the state has larger, more established companies to interface with at the onset. There are very good proposals for approaches to providing tax incentives, establishing technology expansion programs, and for improving interfaces between companies and universities. However, execution of each of these concepts is not simple and has a "time-lag" phase, which means it will take several years to show results. In addition, it would seem some of the recommendations (setting up advisory councils, portfolio-mining efforts, identification of commercialization opportunities) are underway in Kansas according to the 2007 Kansas

Economic Development Strategic Plan, and KTEC is a part of those efforts. The question must be asked – how do you measure the success of these programs?

Final Analysis

Excellent data were collected, excellent comparison with other states was made, and a great number of ideas were generated in this report. The real question is "what is in this report that can be applied and quantified as success measures for KTEC"? Some concepts, such as

- adding a "fund of funds,"
- commercializing more technologies,
- adding more R&D dollars,
- getting more technologies out of universities,
- interfacing more with large companies,
- "branding and communicating" more with constituents within and outside the state,
- establishing more interface at the "Centers of Excellence" level,
- helping to attract more quality research professors at Universities,
- establishing more of an "entrepreneurial climate"

These concepts, and many more, can take many years before they become established or before they show any response at all in the business statistics for a state.

Other programs, such as

- improving SBIR/STTR application and acceptance rates;
- increasing the number of start-up businesses formed from universities and spun out from existing businesses;
- increasing student involvement in entrepreneurism and start-up businesses;
- improving access to capital and increasing the amount of available capital from sources;
- educating the populace on available programs for assistance and the location of capital and assistance; and
- specific tax and growth incentive programs

can all be quantified and measured as contributors to increased success of job creation and business expansion and retention.

These types of programs that must be evaluated more closely and the mechanics of offering these programs should be carefully evaluated by KTEC or its affiliates. It is also obvious, in many circumstances, that RTI has pointed out funding is a serious issue for KTEC relative to its peers.

RTI's three major conclusions point out KTEC is successful at what it does based on interviews and benchmarking; however, funding is an issue if KTEC is to "further improve." There are many recommendations made relative to "better communications," print, advertising, public relations and e-communications; it is not clear how these provide measured ways of increasing KTEC's success level. Little effort is made, however, to connect these comments to KTEC's mission. KTEC already produces an impressive number of press releases. Messages are not always clear, however. Qualitative changes may be needed to promote greater understanding about how KTEC functions and what program outcomes – rather than activities – are. For example, information

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that is more detailed can be contained in the annual report and all annual reports should be posted to the KTEC website.

RTI has provided valuable information on the background of the current situation and the actions of peer states. RTI has also provided an interesting perspective of concepts to consider for KTEC. What should be done, now, is to evaluate specific action items relative to KTEC's purpose and goals. In the process of evaluating specific action items, KTEC should make an effort to determine how and to what extent such action items can be directly measured. In any event, concepts should be prioritized which will have the greatest impact on KTEC's mission and those goals for the relative dollar value in results generated per dollar spent.

Legislative Post Audit Report 2004

"Performance Audit Report – Encouraging Entrepreneurship: Examining Ways Kansas Could Improve Its Efforts" – Dated February 2004, A Report to the Legislative Post Audit Committee

Executive Summary

This report is a performance audit of KTEC (and other agencies) and includes findings, conclusions, and recommendations regarding each agency's role in Technology-based economic development (TBED) in Kansas. A primary recommendation is made in each case/question posed in the course of the audit relative to developing uniform standards and methods for collecting and analyzing job creation data. LPA attempts, in this report, to "functionalize" the measurement of results in Kansas by having each agency report results in the same fashion and by having all programs reduce their output to a "results-based function" so success/failure can be measured in an accountancy-based fashion. In many cases, LPA admits this is not feasible.

LPA asks specific questions in this report relative to efforts made to promote entrepreneurship, weaknesses in programs and what other states have done to address those weaknesses, and what the actual return on investment (ROI) is on entrepreneurism dollars spent compared to business retention dollars spent. There are sub-categories in each section with opinions collected from interviews and research.

The primary summaries are as follows – first, there have been significant dollars expended in Kansas toward entrepreneurship education, entrepreneurship development and there have been three agencies primarily concerned with entrepreneurship in Kansas over the past 20 years – Kansas, Inc.; the Department of Commerce; and the Kansas Enterprise Technology Corporation (KTEC). A key observation is made that the state's institutions of higher learning do not emphasize entrepreneurship as an educational priority and that efforts to provide entrepreneurial education vary greatly from institution to institution.

Second, a key point was made in observing, ***"Entrepreneurship is not a major focus in the state's economic development strategic plan."*** This one fact states volumes about the findings in this particular report. The "typical" findings were observed – lack of risk capital, "spotty" support for management programs, lack of an organized statewide angel network, low research and development capacity, "brain drain" problems, technology transfer issues, the need to attract quality researchers to the state's institutions of higher learning, and low federal grant funding scoring, etc., among other items.

Suggestions were made relative to observations of peer states. Some items are already under consideration – construction of new facilities for research, expansion of existing research facilities, and proposals to increase the state's research and development capacity. In addition, there is a recognition that entrepreneurship needs to be taught at the K-12 level as well as on the University level. There also needs to be prescribed business advisement mentoring networks established. However, it was noted (correctly) that while all of these suggestions are good, they would all take years before any would show an impact on the Kansas economy.

Third, a key question was posed concerning the amount of funding spent on entrepreneurial programs versus retention and recruitment programs. The examples given in the audit (real-time examples) actually showed a miserable record for entrepreneurial businesses (percentage basis) compared to a sparkling record for recruited businesses. These results may have been derived from a limited sample.

However, LPA notes they could not compute an overall ROI for either category of recruited business or entrepreneurial programs. There are too many variables over a 5-year period for each business and each concept for these to be computed. Many state-funded entrepreneurial programs could not tell LPA "which clients they had provided assistance to in previous years" – therefore LPA could not track results. That was a serious issue and improved tracking should permit the stakeholders to provide added tangible results to the governing agencies or supervisory agencies.

A key point made was that LPA had to obtain employment and payroll figures from the Kansas Department of Human Resources (KDHR) because no program had complete or verified information about which clients had started a business, how many were still operating in Kansas, how many jobs had been created, and how much payroll those jobs had generated. That is often understandable in TBED as many start-ups, once they leave an incubator, for instance, no longer report such information to the incubator (if they are still viable as businesses), or they leave the state, or the area, and cannot be tracked. If the incubator (or some other party) is not a shareholder of the company, no one receives active information about the company, therefore no figures are kept by any organization, and thus any information regarding that company is lost.

At the conclusion of the report, several key points are made and two key recommendations are offered. The key points include an observation that it is not possible to compute an overall return on investment for the State's dollars put into business recruitment and start-up programs because of the lack of complete and accurate information. This was one reason for the formation of a state task force dedicated to the standardization of collecting and analyzing data.

Another key point concerned the high rates of failure for start-ups; the LPA noted it was "important for the Legislature to make its goals for funding start-up programs clear" and to invest state resources where companies can be created to meet those goals. It is good that LPA recognizes the obstacles in TBED and entrepreneurism, and the need for clear, measurable goals so progress can be quantified. As mentioned above, the two recommendations were for the State to develop uniform standards for measurement of economic outcomes and for KTEC and other organizations to submit regular reports that display those uniform standard measurements to the legislature.

Appendix B of the LPA report contains the questions posed to interviewees during the process. LPA encountered several issues during the investigative process in obtaining data and getting the information needed to prepare an adequate comparison. It is surprising that company formation data and records for start-up companies that received support (financial and otherwise) were not available from "several sources." It is important that annual reports and other submitted data contain these key elements – jobs created, average salaries, total payroll, taxes generated, total investment dollars – at a minimum.

The LPA report is a tool for working toward better leveraging of the resources in Kansas by recommending a common reporting structure and statewide metric for tracking entrepreneurial activity in Kansas. The LPA report is objective, and does not make subjective judgments or obtuse recommendations.

However, it should be noted that the LPA report is limited in scope; there can be no subjective determinations made from this report relative to the functions of the departments noted in the report, and no opinions can be expressed relative to the activities of each organization. The LPA report itself notes several times, there is a "relative lack of data" to reach a summary conclusion and it also notes there is no "basis to make judgments" given the data available. The only true conclusion that can be made from the LPA report is the need for standardized reporting and better record keeping across Kansas by all agencies, and the need for making entrepreneurism a priority for a better future in Kansas.

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Section III: KTEC Structural and Operations Analysis

The evaluation team sought to view KTEC through a couple of lenses:

1. the apparent statutory intent and the organizations fulfillment of that intent
2. the realities of the innovation environment and KTEC's response to the realities of the environment

KTEC Model

KTEC's enabling statutes describe a collaborative framework for promoting technology-based economic development across the State of Kansas. This framework leverages resources in the academic, private industry, and government sectors through specific programs. Over time and in response to periodic review of what was working within Kansas and other states, some of the details of these programs changed. These changes were made through both formal action (amendment to the statutes) and informal action (amendment to statute execution).

According to statute (74-8102):

> The purpose of the Kansas technology enterprise corporation is to foster innovation in existing and developing businesses, especially the creation, growth, and expansion of Kansas enterprises in a diversified range of primary sectors, which develop value-added products, processes, and services.

The statute identifies existing resource-based industries (agriculture, oil, gas, coal, helium), existing advanced technology industries (aviation, pharmaceuticals, computers, electronics), and emerging industries (telecommunications, computer software, information services and research), but does not limit activity to those industries. The statute thus allows for promotion of innovative, even disruptive, industries that transcend known industry categories. The statute language has proven prescient and flexible enough to accommodate new combinations of technologies.

The statutes also outline activities for fulfilling KTEC's mission, propose entities for performing those activities, and describe mechanisms for how they – and KTEC itself – would be governed. They incorporate four of the five key elements for technology-based economic development described by the State Science & Technology Institute (SSTI):

- Intellectual infrastructure, i.e. universities and public or private research laboratories that generate new knowledge and discoveries
- Mechanisms for transferring knowledge from one individual to another or from one company to another
- Physical infrastructure that includes high quality telecommunications systems and affordable high speed Internet connections
- Highly skilled technical workforce
- Sources of risk capital

The element not directly addressed by the KTEC statutes is physical infrastructure, although KTEC business incubators do offer affordable high-speed Internet connectivity to their client companies.

KTEC university programs (Centers of Excellence, EPSCoR/STAR Fund) address both the intellectual infrastructure and highly skilled technical workforce elements. The five Centers of Excellence also function as a meeting place for university and private industry researchers. With their emphasis on information technology, pharmaceutical chemistry, material science, industrial engineering, and aviation technologies, they can help a

broad spectrum of Kansas companies to innovate strategically and take advantage of current research advances. Combined, the centers assisted 88 companies in FY 2008.

The Experimental Program to Stimulate Competitive Research (EPSCoR) and Strategic Technologies and Research (STAR) Fund programs provide matching funds for university-based research proposals that include federal and private industry partners. In FY 2008, the combined programs attracted $25.2 million in non-state matching funds and involved 20 companies and 166 students. Many of the 16 active projects funded under these programs involve inter-university and multi-disciplinary collaboration. Project areas include aviation design and technologies, ecological forecasting, benign chemical processes, innovative materials, and information computing. The increasing level of industry involvement in these programs may result, over time, in the freer transfer of technology between universities and private companies.

Through the KTEC commercialization centers, knowledge and technology are transferred from one company to another, some of which are located on university campuses. The eight state-local-university partnerships offer customized assistance to emerging high-growth, as well as established Kansas companies. A wide range of business assistance services is offered. In addition, KTEC convenes regular conference calls and other gatherings that bring these diverse groups together for open information exchange. The Entrepreneur-in-Residence program also serves the knowledge transfer goal. The Mid-America Manufacturing Technology Center (MAMTC) is a wholly owned subsidiary of KTEC that receives substantial federal funding from the National Institute of Standards & Technology (NIST) for the services its provides to small- and medium-sized manufacturing firms through the NIST Manufacturing Extension Partner (MEP) program.

Information is also exchanged through the Software and Information Technology Association of Kansas (SITAKS), established in June 2008. This corporate membership group acts as a forum for the 3,200 software, IT, and telecommunications companies located in Kansas and their professional staff as well as IT staff imbedded within companies. This forum offers an informal method for transferring knowledge across a group that is geographically scattered and is a "best practice" tested successfully by other states for promoting well-defined technology clusters and bringing highly skilled technical workers together to share ideas and spark innovation.

The KTEC Pipeline program addresses a perceived gap in entrepreneurial awareness and education by bringing promising innovators together for structured training and mentoring sessions with the goal of defining and developing a marketable business plan and capital financing strategy for their particular technology product or concept. This addresses both the risk capital and knowledge transfer elements of technology-based economic development.

KTEC's seed capital financing program was designed by legislators (K.S.A. 74-8109) to build risk capital capacity in the State of Kansas. This is accomplished through KTEC's direct investment in start-up companies and through its support of other seed capital and angel investment activity across the state. Also, KTEC was designated by the State as administrator of the Kansas Angel Investment Tax Credit program, established as part of the Kansas Economic Growth Act of 2004 (KEGA), for which KTEC helped craft the enabling legislation. According to K.S.A. 74-8131, the Kansas Angel Investor Tax Credit Act, an accredited investor can receive a 50 percent tax credit on cash investments of up to $100,000 in a qualified Kansas business. Legislators revised the program in 2007 to extend the number of eligible years for bioscience companies to ten years. They also opened up the program to allow tax credits to flow through to individuals and to allow transfer or sale of tax credits. As of February 2009, 38 companies are qualified under the program.

The general program areas ascribed to KTEC and their articulation as of January 2009 are described below.

University Programs

In accordance with K.S.A. 74-8106(f), KTEC and its Board of Directors established a University Programs Committee that is responsible for overseeing Center of Excellence and EPSCoR programs:

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- Performance
  - Evaluate Centers of Excellence through progress reports and presentations
  - Conduct biennial peer reviews of centers
- Funding
  - Make annual center-specific funding recommendations to the board of directors
  - Accept, evaluate, and recommend proposals for grants under the EPSCoR and STAR Funds
- Expansion
  - Develop, adopt, and publish criteria for use in evaluating proposed centers of excellence
  - Evaluate and designate new centers of excellence in accordance with criteria contained in K.S.A. 94-8106 and KTEC's own evaluation standards

The University Programs Committee reports regularly to the board of directors. At the June KTEC board meeting, the committee presents findings from its peer review and its budget recommendations.

University Programs Committee – Procedures

In addition to fulfilling the above, the University Programs Committee reports regularly to the board and may also perform other activities and investigations as deemed necessary by the committee or the board of directors. The committee is composed of between four and seven members with technical and/or business expertise. It may include members of the KTEC board of directors, KTEC staff members, and others. As of this study's writing, no member of the KTEC board of directors was on the University Programs Committee. Although board representation is not required by statute, KTEC staff declared its intention to recruit a board member to the committee within the near future.

The committee meets quarterly, one week before the board meeting. The focus of meetings alternates between the Centers of Excellence and EPSCoR programs:

- Spring and Fall – Oriented toward EPSCoR; program directors deliver presentations about projects underway and on the horizon. Federal funding trends are also discussed.
- Summer – Results from the peer review of the Centers of Excellence are presented. Center directors make their respective budget proposals and the committee forms budget recommendations. Discussion about near-term EPSCoR proposals takes place.
- Fall — Oriented toward EPSCoR; program directors deliver presentations about projects underway and on the horizon. Federal funding trends are also discussed.
- Winter – Center of Excellence updates and discussion occurs about common concerns.

KTEC helps build bridges between universities and private industry through these programs. Better understanding about university and industrial resources also gives KTEC access to expertise for evaluation of proposals it receives for making capital investments in pre-commercial research.

Governance

Because all of the EPSCoR scientific review work is conducted by the relevant federal government agencies, the KTEC staff burden is less onerous than for other KTEC programs. The University Program Committee makes it recommendations on funding priorities based on the specific proposals' market viability, commercialization readiness, and strategic technology. Some of the non-EPSCoR proposals have a heavier federal match potential. For example, a grant of $2 million may only require $100,000 in matching state funds (20:1 leverage). The

required state match for EPSCoR tends to be higher, resulting in a leverage of 4:1 or 3:1. KTEC staff manages the oversight process for the University Programs Committee, working with university researchers on proposal packages. The key questions posed in evaluating project proposals are:

- How will it contribute to the research infrastructure in Kansas?
- What is the potential for commercialization?

Centers of Excellence (74-8106)

Five university-based research centers form the basis for collaboration between private industry and academia. Although the Centers differ in terms of subject matter emphasis, the common goal is to connect Kansas-based entrepreneurs and companies with university-based resources – students, professors, research, and intellectual property (e.g., technology ready for licensing). Kansas Legislature created three of the Centers (Higuchi, AMI, and NIAR) in 1996. KTEC contributes to their funding but they are not wholly financially dependent on KTEC for their continued operation. Funding is provided through the home universities, sponsored research, private donations, and federal funding.

Network benefits exist:

- KTEC receives high quality and free counsel about the viability of technological approaches proposed by companies that apply to KTEC for financial assistance through the Technology Commercialization Seed Fund (TCSF) and Applied Research Matching Fund (ARMF).
- KTEC board members receive information about research directions.
- Companies and single entrepreneurs receive information about promising and even commercializable research.
- Faculty and students are introduced to Kansas-based individuals, companies, and research opportunities.
- Identifying matching funds to meet federal RFP requirements is simplified – and corporate research project partners or co-investigators are identified.

Funding Mechanism

The original concept for the Centers of Excellence was to establish three very large funds, each representing different stages of intellectual property development: basic research, applied research and development, and technology transfer. Each of these funds would support establishment of a few centers. In practice, this approach would have been administratively burdensome and not cost-effective. In addition, the amount of money available from KTEC to the Centers of Excellence covers only a fraction of their budget. Approximately 30 percent of KTEC's budget goes to the Centers of Excellence annually.

The KTEC Board of Directors votes annually on its contribution to the Centers' operating budgets. KTEC's annual report shows its contribution to the Centers as an aggregate number, rather than by specific Centers. Likewise, the Centers themselves differ about their budget reporting. For some years, contributions from the State, the university, and KTEC are individually specified and for others, the contributions are aggregated. The general trend, however, seems to be toward increasing contributions from private industry and State sources to support center operations with the decreased contribution of federal dollars as a percentage of operating budget.

Peer Review of Center Operations

To ensure that Centers exhibit national standards of excellence and potential for commercial application, peer reviews are conducted before initial funding is allocated and then biennially for existing Centers. These comprehensive reviews have four main components: full-day site visits, detailed discussion with key Center and

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committee personnel, summary presentation to the board, formal reports to the directors. The pool of peer reviewers, all of whom are independent from each Center, has stabilized over the years and are invested in the process. The continuity in the review team helps facilitate the process. The teams are familiar with Center activities and achievements from prior years. Relationships have formed between reviewers who are recognized for their industry experience and/or academic credentials. According to KTEC staff, the review teams truly add value and make useful recommendations that are adopted. All but one of the reviewers is from out of state.

In preparation for the site visit, Centers send detailed plans and materials on all projects to review team members two weeks in advance. They meet with KTEC staff the evening before to discuss issues and questions to reduce reliance on rating forms. The center director is debriefed as part of the visit. Reviewers draft reports over the next two weeks, identify additional questions, and develop a report. The report goes to the University Programs Committee held prior to the June board meeting and the biennial question is posed: What has been the progress over the past two years?

The board reviews one slide per center that contains the main findings and recommendations. Many recommendations take years to implement and may be difficult to start, for example, changing intellectual property policy, contracting policy, building capacity for defense-related research. The average cost per review is $5,500. The primary review questions and details about the peer review policies and procedures are located in Appendix C.

Outcomes

The number of companies that receive assistance through the centers of excellence varies from year to year. Eighty-eight companies were assisted in FY 2008.

University of Kansas (Life Sciences, IT and Telecommunications)

The Biotechnology Innovation and Optimization Center (BIOC) provides a centralized focus for moving University technologies into the private sector from pharmaceutical and biomedical research on both the Lawrence and Medical Center campuses. BIOC is a separate (economic-development-related) unit embedded within the greater Higuchi Biosciences Center, which received a total budget of $16.68 million. The Higuchi Biosciences Center was first established as the Center for BioAnalytical Research (CBAR) in 1983 and then reorganized as the Higuchi Biosciences Center in 1989. The center is composed of four sponsored research centers and four thematic research centers, in addition to BIOC.

Sponsored Research Centers:

- NIH Center of Biomedical Research Excellence (COBRE), Cancer Experimental Therapeutics
- NIH Center of Biomedical Research Excellence (COBRE), Protein Structure and Function
- NIH Chemical Methodologies and Library Development Center of Excellence
- Program Project on Aging

Thematic Research Centers:

- Center for BioAnalytical Research (CBAR)
- Center for Drug Delivery Research (CDDR)
- Center for Neurobiology and Immunology Research (CNIR)
- Center for Drug Discovery

Funding Mechanism

KTEC provided $1.08 million for the Higuchi Biosciences Center or 6.5% of its budget in FYI 2008.

Outcomes

Numerous grants and technology start-ups (through Higuchi). $8.1 million grant from the Ewing Marion Kauffman Foundation (2008) to establish the Institute for Advancing Medical Innovation, with matching support from the University of Kansas Endowment Association.

The Information and Telecommunications Technology Center (ITTC)

The Information and Telecommunications Technology Center (ITTC) was formed in 1997 from the merger of the Center of Excellence in Computer-Aided Systems Engineering (CECASE), established in 1989, and the University of Kansas Telecommunications and Information Sciences Laboratory. The purpose is to promote technology transfer and the commercialization of university-based information technology. Ten technology licenses are available as of February 2009 according to the ITTC website. The center is composed of six labs: bioinformatics, computer systems, e-learning design, intelligent systems, communications, and networks, radar/remote-sensing. Its annual budget is approximately $4 million.

To date, the majority of patents granted (86 percent) have been for innovation related to the telecommunications industry. The incidence of patents granted has declined markedly since 1999, although several are currently pending: [7]

Figure 2: ITTC Patents Granted

ITTC Patents Granted											
1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
2	7	7	4	3	6	3	3	1	1	-	1

Funding Mechanism

Federal grants (72 percent), State of Kansas (17 percent), private industry (9 percent)

Leverage/Partners

Department of Defense (DoD); NASA; Department of Energy (DoE); National Science Foundation (NSF); Vermeer Manufacturing Company (19 patents) and Sprint Communications (5 patents), among others.

Outcomes

37 patents filed from 1997 to 2008 in the following areas: machinery/boring equipment (18), telecommunications (14), electronics/display (3), radar/sensing (2); video monitoring start-up company, Veatros, received venture capital funding and was acquired in 2007 by DivX; Rush Tracking Systems teamed with center to commercialize environmentally robust RFID tag technology and sign licensing agreements with two companies.

Kansas State University (Advanced Manufacturing)

The Center for Research in Computer-Controlled Automation (CRCCA) was established in 1984 and reorganized as the Advanced Manufacturing Institute (AMI) in 1991. Work performed by its engineers complements that done at other Centers of Excellence, such as NIAR (work with Cessna on a cost-saving metal bonding technique). AMI associates have assisted at more than 300 companies in at least 57 different Kansas counties since its inception. Internship opportunities introduce students to real world projects. Students and faculty provide a range of services:

[7] Source: ITTC website, accessed 25 February 2009. The number of different patents granted is somewhat misleading. Thirteen, for example, are for trench-less underground boring, but filed in different countries.

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- Business planning and research
- Product development
- Design verification
- Custom equipment development
- Manufacturing process development
- Bioprocessing and chemical engineering
- Technology development and commercialization

Funding Mechanism

KTEC provides approximately 20 percent of AMI's annual operating budget.

Leverage/Partners

The Manufacturing Learning Center, originating from a 1998 National Science Foundation award of $800,000 is one of the key components of the Center. KTEC contributed an additional $450,000 for the Learning Center.

Outcomes

Completes about 80 projects a year.

Wichita State University (Aviation)

The Institute for Aviation Research, established in 1985, was renamed the National Institute for Aviation Research (NIAR) in 1990. In 2006, NSF ranked NIAR and WSU fourth in aeronautical research and development among U.S. universities, ranking about equal with MIT and the Air Force Academy. Its funding overall has increased 40 percent from 2005 to 2006, giving it an operations budget of more than $35 million (almost double its budget in FY 2002). The percentage of operating budget provided by private industry has increased steadily, from 12.7 percent in FY 2002 to 41 percent in FY 2008. Federal funding, as a percent of its operating budget, has declined and was at 37 percent in FY 2008.

NIAR is home to its own set of four centers of excellence within its 135,000 square feet of research and office space:

- Center of Excellence for Composites and Advanced Materials (CECAM)
- Center of Excellence for General Aviation Research (CEGAR)
- National Center for Advanced Materials Performance (NCAMP)
- Center for Friction Stir Processing (CFSP)

Beginning in 1996, out of the EPSCoR fund, KTEC supported the Advanced Design, Research, and Manufacturing Center, centered at NIAR, involving four universities, and co-funded by Wichita aircraft manufacturers. In 2004, the Kansas State Legislature created the NIAR/Industry/State (NIS) research program to support the State's aviation manufacturing sector. Research projects are identified and selected by an executive committee made up of: The Boeing Company, Bombardier/Learjet, Cessna Aircraft Company, Hawker Beechcraft Corporation, and Spirit AeroSystems. Annual funding for FY 2004 through FY 2007 was at the $2 million level. For FY 2008, it was $4.75 million.

Funding Mechanism

KTEC contributes between 2 percent and 3 percent of NIAR's annual budget.

Leverage/Partners

Federal Aviation Administration (FAA), NASA, NSF

Outcomes

Partnerships with universities inside and outside Kansas. Undergraduate research assistantships (100 in FY 2008). Internships and collaborative projects with private industry.

Pittsburg State University (Advanced Materials and Coatings)

The Kansas Polymer Research Center was established was established in 1994 to carry out research in the polymer/plastics area and to complement the educational program offerings in the College of Technology with applied research. One of the world's leading centers specializing in vegetable oil-based polymer research and development, KPRC scientists work with industrial partners (e.g., Cargill, Inc.), state and federal agencies, and producer associations to develop and commercialize Pittsburg State University's intellectual property. KPRC moved into a new $5.7 million facility in 2007, a resource for bench-to-market product development (e.g., full-capability wet lab, injection molding machines and extruders, thermo-forming machines, analytical testing equipment and services) for Kansas companies and entrepreneurs.

Funding Mechanism

KTEC has provided $310,254 annually to KPRC for the past several years, or close to 33 percent of KPRC's annual budget. KPRC's FY 2008 budget was $1.0 million; the projected FY 2009 budget is $1.8 million.

Leverage/Partners

Alliance for Technology Commercialization, Kansas Bioscience Authority

Outcomes

KPRC was honored by the National Academy of Sciences as recipient of the 2007 Presidential Green Chemistry Challenge Award in the Designing Greener Chemicals category for the research performed by KPRC scientists Dr. Zoran Petrovic, Dr. Ivan Javni, Dr. Andrew Guo, and Ms. Alisa Zlatanic. The group is the only research institution in the state of Kansas to win this prestigious honor. Over the past 11 years, KPRC was granted 11 patents, has five patents pending, and made an additional 100 invention disclosures. An example of the types of innovation emerging from KPRC is its second patent issued in 2002 for using soybeans rather than petroleum products in coating applications – an early "green" approach. With assistance from KTEC and the Alliance for Technology Commercialization, KPRC recently formalized its processes related to invention disclosure and commercial evaluation of its research portfolio.

Experimental Program to Stimulate Competitive Research (EPSCoR) and Strategic Technologies and Research (STAR) Fund

KTEC's funding channel to deliver project-specific grants to Kansas universities has two components: EPSCoR and STAR Fund. In addition to acting as a conduit for state funds so that university researchers can meet matching levels designated by federal agencies, the companion programs attract industry partners for projects. The focus of EPSCoR and STAR Fund projects is not to create jobs, but to build research capacity and intellectual property that will provide the basis for new commercial activities and markets for existing Kansas companies and start-ups. Relationships developed during projects may also lead to better understanding about what industry needs from universities in terms of student preparation and curriculum priorities.

EPSCoR is a long-running federal experiment that attempts to improve allocation of federal dollars among states that have not achieved certain thresholds of funding. Kansas is in the fourth cohort of EPSCoR states, having

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entered in FY 1992 (at the same time as Nebraska).8 KTEC is the state's designated administrator for the program.

The University Programs Committee directs the program, and brings industry input into the analysis of EPSCoR/STAR Fund proposals. A key component of several projects is interdisciplinary and inter-institutional collaboration.

As of February 2009, five federal agencies provide grants to Kansas under the EPSCoR program through the Regents' universities: Department of Energy (DoE), Department of Defense (DoD), National Aeronautics and Space Administration (NASA), National Science Foundation (NSF), and the Environmental Protection Agency (EPA). A combination of state matching dollars and soft or in-kind participation is required. Universities also may provide matching dollars. Kansas is now at the upper threshold for EPSCoR funding from DoD and may graduate out of the EPSCoR program for DoD, due in part to the National Bio and Agro-Defense Facility (NBAF) award.

Beginning in FY 2002, KTEC awarded $60,000 annually from the EPSCoR/STAR Fund to a team of researchers at the University of Kansas for the purpose of developing mobile sensors which would improve the ability to study the effects of climate change on the polar ice caps. The NSF provided just under $1,000,000 annually to the program. As is often the case, KTEC's funds were important in supporting core costs that were not in the federal budget. This project laid the groundwork for designation of a federally-funded research center.

In 2005, KU was successful in receiving designation of the Center for Remote Sensing of Ice Sheets (CReSIS) as an NSF Science and Technology Center, with the mission of "developing new technologies and computer models to measure and predict the response of sea level change to the mass balance of ice sheets in Greenland and Antarctica." KTEC has been providing $125,000 annually to CreSIS, with annual matching funds from the NSF of $3 million.

CReSIS is comprised of six partner universities, with KU serving as lead institution and headquarters. In addition to its core research mission, the Center fosters scientific and engineering education. The Center is making a significant contribution to the subject matter and supports many of KTEC's objectives. It has a full time staff of 19, a core faculty of about 40, strong student participation and educational outreach.

Website = https://www.cresis.ku.edu/ – Description received from KTEC Staff

The STAR fund complements the EPSCoR program. It was created in 2001 to expand university research, encourage collaboration between universities and private industry on commercialization opportunities, promote competitive advantage, build critical mass in strategic technology niches, and attract federal and industry funding to Regents Universities. Projects are not restricted to specific a specific set of federal agencies, unlike EPSCoR, and are focused on areas in which Kansas already has significant intellectual and commercial capacity: aircraft design, computing and aerospace technologies, ecological forecasting, benign chemical processes, and novel materials.

Funding Mechanism

Variable, depending on federal award amounts for both EPSCoR and STAR Fund activities

[8] The other EPSCoR states and U.S. territories as of February 2009 are: Alabama, Alaska, Arkansas, Delaware, Hawaii, Idaho, Kansas, Kentucky, Louisiana, Maine, Mississippi, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Oklahoma, Puerto Rico, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virgin Islands, West Virginia, Wyoming.

Leverage/Partners

Various industry partners, depending on the particular project

Outcomes

EPSCoR has stimulated significant and increasing attraction of federal funds to Kansas for university-based research projects. Increased collaboration among universities as exemplified by the NSF award of $6.75 million for an ecological forecasting project that with co-principal investigators from KU and KSU. Figure 3 shows how KTEC contributions have been leveraged through the EPSCoR and STAR Fund programs, especially since 2001. The chart (Figure 4) shows that, over time, KTEC dollars have become "more efficient" – they are being leveraged to a higher total of dollars invested for awards.

Figure 3: EPSCoR and STAR Fund Leveraged Dollars

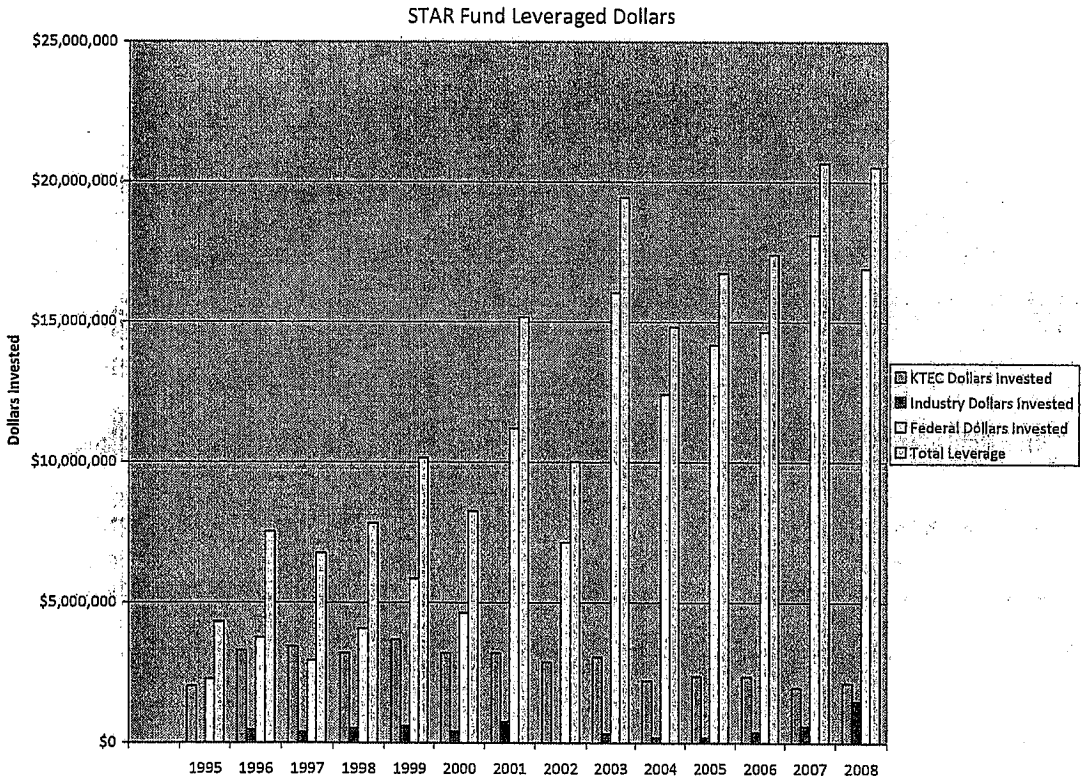

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Figure 4: Leverage of KTEC Dollars

Year	KTEC Dollars Invested	Federal Dollars Invested	Industry Dollars Invested	Total Leverage	Leverage Ratio
1995	$2,028,793	$2,282,793	-	$2,282,793	1.1
1996	$3,298,985	$3,756,018	$470,000	$4,226,018	1.3
1997	$3,435,000	$2,938,689	$395,000	$3,333,689	1.0
1998	$3,200,000	$4,078,052	$545,000	$4,623,052	1.4
1999	$3,693,735	$5,843,179	$616,500	$6,459,679	1.7
2000	$3,200,000	$4,634,875	$414,650	$5,049,525	1.6
2001	$3,200,000	$11,205,105	$761,217	$11,966,322	3.7
2002	$2,884,921	$7,139,009	-	$7,139,009	2.5
2003	$3,062,167	$16,053,803	$335,000	$16,388,803	5.4
2004	$2,215,815	$12,413,683	$200,000	$12,613,683	5.7
2005	$2,374,590	$14,183,800	$200,000	$14,383,800	6.1
2006	$2,361,094	$14,643,185	$400,000	$15,043,185	6.4
2007	$1,976,975	$18,101,720	$595,000	$18,696,720	9.5
2008	$2,139,477	$16,908,557	$1,488,533	$18,397,090	8.6

Kansas Angel Tax Credit Program

The Kansas Angel Tax Credit program was developed by KTEC as part of the 2004 Economic Development Growth Act. The purpose of the Kansas Angel Investor Tax Credit Act is to facilitate the availability of equity investment in businesses in the early stages of commercial development and to assist in the creation and expansion of Kansas businesses, which are job and wealth creating enterprises, by granting tax credits against Kansas income tax liability of investors investing in these businesses. The program issues up to $6MM in tax credits annually (amended from $2MM in 2007). Since the program was started in 2005, 67 companies have been qualified under the statute. KTEC has issued $13.375MM in tax credits from 2005 – 2008. The total capital raised by companies receiving tax credits over the same period is $118.8MM. Tax credits are only eligible for natural persons and cannot be issued to investment funds. The "seeding" of capital by individual investors attracts institutional investors explaining why almost $9 of capital was raised for each $1 of credit issued.

The tax credit program issues up to $50K of tax credits for investment up to $100K per company, per year. Natural persons receiving the credit must make a qualified investment into a Kansas qualified business. The investor must register on line at www.kansasangels.com , submit a copy of the check and signature page indicating a valid investment has been made. KTEC issues the tax credit directly to the investor and reports this activity to the Department of Revenue.

Each company must become a qualified business. The statutes give KTEC latitude to evaluate the business plan, financials, management, and many other areas to determine who should receive qualification. KTEC staff recommendations are sent to a subset of the KTEC Investment Committee (3-person committee) for approval. The statute does not require KTEC to seek approval from the investment committee. This process was recommended to the Investment Committee by staff and adopted after the first year of tax credit operations.

Many of the "fly-over" states have angel tax credit programs. Missouri is currently trying to pass legislation that virtually mirrors KTEC's current statutes. Most of the states do not allow the tax credits to be sold or transferred. KTEC amended the statutes in 2007 to provide for sale and transferability. This change allows investors to sell their tax credit once and in its entirety. The rule protects against a secondary market being created. All transfers flow through KTEC for verification with the department of revenue and appropriate

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documentation. Since the change in policy, the tax credit program has helped raise $4MM from out of state investors, including some international investors.

Many companies are able to raise capital easier due to the tax program. In 2007 - "Of the money ImmunoGenetix Therapeutics Inc. has raised to date, a quarter of that has come into the company due to the angel tax credits in Kansas," ImmunoGenetix President James Laufenberg, Lenexa said. "The tax credits provide substantial support to an emerging company at this stage and help to create additional interest in the opportunity.

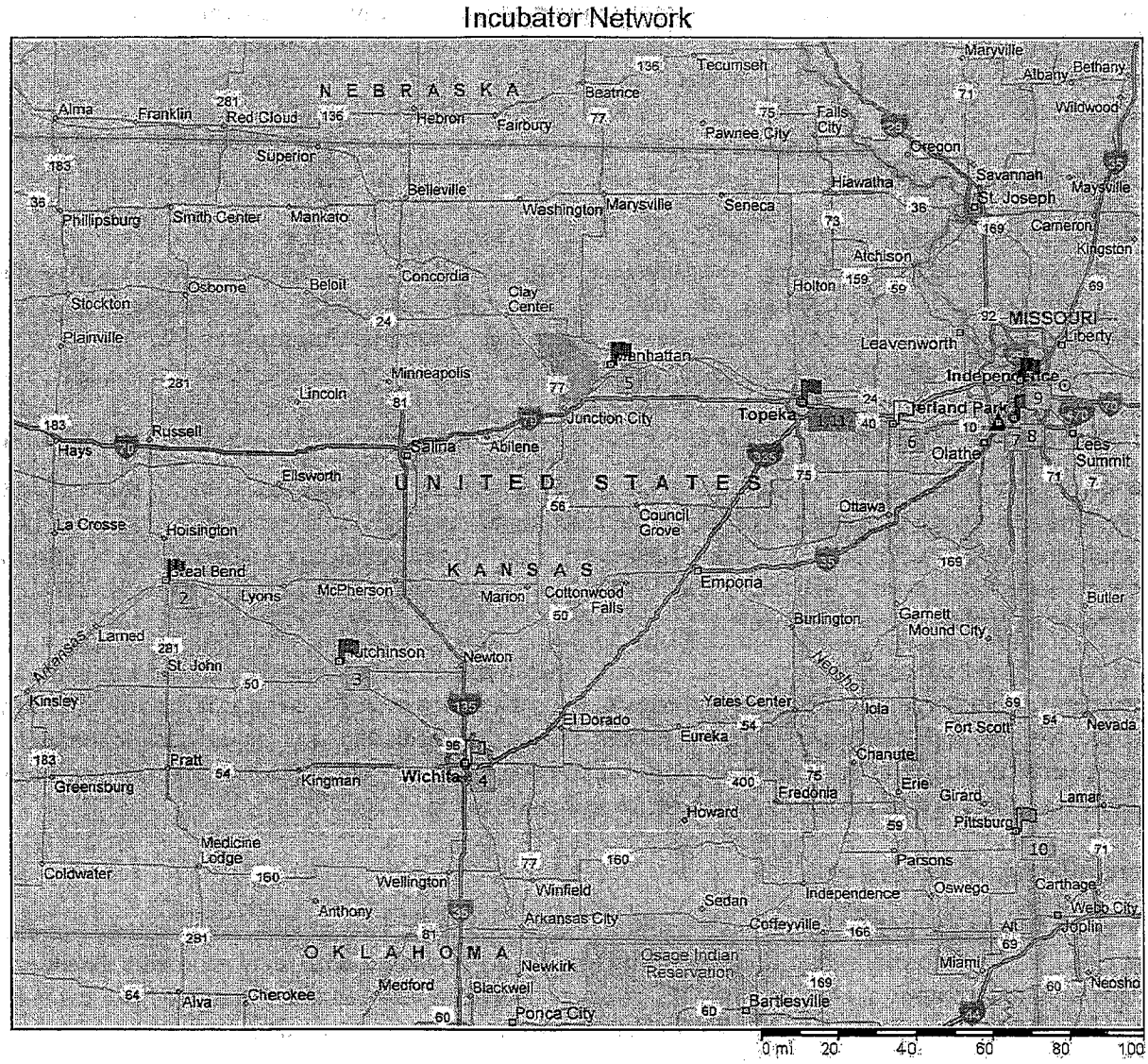
KTEC collects annual economic impact data related to jobs, revenue and capital raised. This data is reported to the KTEC board of directors, the Governor and the Legislature.

Commercialization Program (K.S.A. 74-8102)

The business assistance incubator program activities typically enter the innovation life cycle at the commercialization stage, i.e. early in the process. The focus at this stage is on converting technology that has passed through the development and testing stage into a marketable product, or at least, a marketable product concept. By this stage, the innovator usually needs financing to sustain testing and product development and must rely on those with the business expertise to help perform market analysis, develop a business plan, and outline a strategy for raising capital. Although resources associated with the incubator programs are based in university towns, on-campus, and have close ties with university personnel, the client population is more heavily skewed toward non-academic entrepreneurs.

Unlike the federally funded Small Business Development Centers (SBDC), business assistance incubators generally serve selected clients – SBDCs must work with all who request help. KTEC supports a network of eight business incubators, thereby providing "technical referral services to such small, new, emerging, or mature businesses." Each incubator provides a similar range of business planning services, but the particular expertise of personnel guides which incubators are recommended for a specific client. As of February 2009, the incubator network looks like this:

Figure 5: Kansas Incubator Network Location Map



1. KTEC
2. Western Kansas Technology Corporation (WKTC), Great Bend
3. Quest Business Center for Entrepreneurs, Hutchinson
4. Wichita Technology Corporation (WTC), Wichita
5. National Institute for Strategic Technology Acquisitions and Commercialization (NISTAC), Manhattan
6. Lawrence Regional Technology Center (LRTC), Lawrence
7. Enterprise Center of Johnson County (ECJC), Lenexa
8. Mid-America Manufacturing Technology Center (MAMTC)
9. University of Kansas Medical Center Research Institute, Kansas City
10. Alliance for Technology Commercialization (ATC), Pittsburg

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When first configured, this network of incubators, whose daily operations are independent of KTEC followed a hub-and-spoke communications model. KTEC staff connected with individual incubators, but the potential network power[9] was not being tapped. Better practices are now in place and the network is beginning to learn how to perform like a matrix organization so that network affiliates and their clients can benefit from the cross-fertilization of ideas.

Communications Model

KTEC staff facilitates quarterly network meetings with all centers of excellence and incubators. Meeting locations rotate around the state. Each representative reports, briefly, what companies are working throughout the state. The communication continues through monthly conference calls to discuss deal flow, angel investment activity, solicit guidance from network colleagues, and recommend approaches for specific clients. Deal flow is also captured on the Intranet site so that the entire network can see the review stage of a specific client, reports from angel groups, technology applications, and opportunities for offering assistance. One of the incubator directors created standardized legal forms for posting to the Intranet, thus saving time and legal fees.

Transparency across the network is the goal: everyone in the network should know each other's business so that the focus is turned outwardly, toward the client, rather than toward the individual network components. In this way, the expertise and knowledge of the entire network can be tapped. KTEC staff also visit each center and incubator every year for informal discussions about what is going on, what KTEC is doing well, what KTEC could do better, and what could be done in concert.

This model has evolved especially since 2006. Prior to that time, centers of excellence did not attend the network meetings. Investment pipeline information was not shared on a monthly basis as it is now. Information sharing across the network, as opposed to through KTEC as the mediator, was developed deliberately by establishing a consistent and open communications infrastructure for the participants. Greater transparency may also reduce suspicions that assistance is subject to undue influence.

Commercialization Nodes

The business incubators are independent organizations that control their own budget and businesses portfolio. Most have small staffs of no more than three persons. They work in alliance with local economic development organizations and government agencies. MAMTC, however, is a statewide resource that is wholly owned and administered by KTEC. Its focus is on small and medium-sized manufacturing companies.

Alliance for Technology Commercialization (ATC), Pittsburg

ATC is located at the Pittsburg State University Business and Technology Institute, a regional economic development organization serving 13 counties in Southeast Kansas.

- Investment Fund: Milestone Ventures, LLC
- Client Process: Posted on website www.atckansas.com
- Companies Listed: Brainchild, LLC; Control Vision Corporation, Pixius Communications, Relight America, Renegade Tool, VasoGenix Pharmaceuticals
- Outcomes: Four of its clients have received funding from KTEC and are currently in the active portfolio (Control Vision Corporation, Pixius Communications, Relight America, VasoGenix Pharmaceuticals)

[9] David Singh Grewal, "Network Power," Yale University Press, 2008.

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Enterprise Center of Johnson County (ECJC), Lenexa

ECJC is located in a stand-alone building. ECJC was established in 1994 and managed by Prairie Investment for Technology Advancement, LLC (PITA), one of eight for-profit seed capital companies in Kansas funded by KTEC. The fund provided limited early-stage, equity risk capital to technology-based ventures with the potential for high growth and significant returns on investment. The funds were not limited to companies based in Johnson County. All funds were expended by 2003 and the Fund management was returned to KTEC in July 2007.

- Investment Group: Mid-America Angels Network
- Client Process: Posted on website www.ecjc.com
- Clients: 30 including six that have received funding from KTEC and are currently in the active portfolio (ImmunoGenetix Therapeutics, Innovia Medical, Rhythm Engineering, Rush Tracking Systems, SoftVu, VasoGenix Pharmaceuticals.
- Outcomes: Since 1999, ECJC companies have created 675 jobs, raised more than $45M, and generated over $32M in sales. Started Kansas Women's Business Center (2000). In 2006, founded (with assistance from the Kauffman Foundation and the Angel Capital Association) and co-managed the Mid-America Angels Network with LRTC (2006) and – 102 members who have invested nearly $3.8M in 12 companies.

Lawrence Regional Technology Center (LRTC), Lawrence

- Investment Group: Mid-America Angels Network
- Client Process: Posted on website www.lrtc.biz
- Clients: III Sigma Company; Admunex Therapeutics, Inc.; BioComp Systems, Inc.; BioScience Innovations, Inc.; Blue Sky Design & Promotions, L.L.C.; Cadstone, L.L.C.; CritiTech, Inc.; Deciphera Pharmaceuticals, Inc.; eLearning Creations, Inc.; Flint Hills Scientific, L.L.C.; Griffin Technologies, L.L.C.; GreenSoft Solutions, Inc.; KC BioMedix, Inc.; Proteon Therapeutics, L.L.C.; T-Vax Biomedical, L.L.C.; ThinkGEO.
- Outcomes: Mid-America Angel Investor Network. Client companies have raised approximately $78,000,000 in financing and created approximately 138 net jobs with an average salary of almost $66,000.

National Institute for Strategic Technology Acquisitions and Commercialization (NISTAC), Manhattan

Founded in 1994 as the Mid-American Commercialization Corporation (MACC) and renamed in 2004, NISTAC is a not-for-profit, 501(c)3 corporation, organized under the auspices of Kansas State University (K-State) and the State of Kansas via the Kansas Technology Enterprise Corporation (KTEC). Management, human resource, and financial services are also delivered through Mid-America Technology Management, Inc., a wholly owned NISTAC subsidiary. Originally named the Mid-America Commercialization Corporation (MACC), NISTAC is also co-sponsored by the City of Manhattan, Kansas, and the Manhattan Area Chamber of Commerce. Along with these and other partners, NISTAC launched the Knowledge-Based Economic Development (KBED) initiative in 2008.

- Website: www.k-state.edu/tech.transfer/NISTAC
- Clients: Ag-Renew Global, Inc.; KCAT/TLC Teaching Language & Culture; Global Lipidomics; PharmaCATS; Veterinary Diagnostic Labs; KCAT/Counseling Services; Kansas Advanced Technologies, LLC; Scavengetech; Nacelle Therapeutics, Inc.; NutriJoy; MotivEngines LLC, GTL Petrol; Sunflower Integrated Bio Energy Corporation.
- Outcomes: Creation of graduate intern programs and a new technology entrepreneur track within the MBA degree program of K-State's College of Business Administration. Phase I SBIR grants from the National Institutes of Health (for Nacelle). At least two client spin-offs from KSU have received funding

from KTEC and are currently in its active portfolio (NutriJoy and NanoScale Materials). Coca-Cola Company acquired 51 percent of NutriJoy in January 2008.

Quest Business Center for Entrepreneurs, Hutchinson

Quest offers business planning guidance and financial planning free of charge for the residents of Reno County, as well as high-speed Internet connectivity.

- Investment Fund: Quest Venture
- Website: www.hutchquest.com
- Clients/tenants: 21 businesses representing various services sectors.
- Outcomes: N/A

University of Kansas Medical Center Research Institute, Kansas City

Established by the University of Kansas Medical Center in 1992, the Research Institute is a private, not-for-profit 501(c)3 corporation established to promote and support medical research and faculty invention disclosures. It administers federally funded and privately funded research projects and clinical trials within the University of Kansas Medical Center with a major objective of enhancing the research capability of the University of Kansas Medical Center faculty for the benefit of the public. It fulfills its role by fostering partnerships between academic researchers and private sector organizations, enhancing revenues through technology transfer to the private sector, and acting as facilitator among interested commercial parties both in the U.S. and abroad. The Research Institute appears to be transferring attention to the Kansas Bioscience Authority as the latter rolls out. This logical shift aligns with best practices for developing technology clusters. Through restructuring of incubator and Center of Excellence resources, KTEC has supported the university's alignment of resources on both campuses toward clinical translational research in therapeutics.

- Investment: Various internal funding opportunities for KU Medical Center faculty.
- Outcomes: Received $2 million (with the University of Kansas Medical Center (KUMC)) from Kansas Bioscience Authority in 2008 to match a $3 million grant they recently received from the Economic Development Administration of the U.S. Department of Commerce (EDA). KUMC / KUMCRI would provide the remaining $1 million match. The funds will be used to renovate the existing Breidenthal Research Building on the Medical Center campus for use as a bioscience facility

Western Kansas Technology Corporation (WKTC), Great Bend

KTEC contracts with WKTC to provide services to entrepreneurs and small technology companies in western Kansas. WKTC also provides technical assistance on behalf of the Mid-America Manufacturing Technology Center. WKTC helped 135 companies in FY 2008.

- Website: See KTEC website
- Clients: (geographical sampling): New Dymax (Wamego); MAC Equipment (Sabetha); Flame Engineering (LaCrosse); Wilkens Manufacturing Co. (Stockton); Formation Plastics (Quinter); Osborne Industries (Osborne).
- Outcomes: Six companies are entering or expanding market position.

Mid-America Manufacturing Technology Center (MAMTC)

MAMTC is a wholly owned subsidiary of KTEC that delivers lean enterprise, quality, and technical engineering services to companies across the state. In addition to revenue from services to clients, it receives annual funding from KTEC through the State Economic Development Initiatives Fund ($1.4 million in FY 2008) – 11 percent of KTEC's total EDIF expenses. MAMTC also receives approximately $2.4 million annually in grant

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funding from the federal National Institute of Standards and Technology (NIST) to fulfill the role of Manufacturing Extension Partner, a support program geared toward small- and medium-sized manufacturing enterprises.

- Client Process: Posted on website www.mamtc.com
- Clients/Portfolio Companies: Diamond Coach Corporation (Oswego); IPS Networking (Wichita); Osborne Industries (Osborne); Carpet-Dog™ (Wichita); Del Monte Foods (Topeka and Lawrence); SPX Corporation (HQ in South Carolina)
- Outcomes: Delivers in-depth engineering and business assistance services to about 100 companies per year and reaches another 300 to 400 companies through seminars and outreach programs. Won a three-year contract to train 420 SPX employees in lean principles. Runs the State of Kansas Shingo Award program for excellence in manufacturing.

Wichita Technology Corporation (WTC), Wichita

Wichita Technology Corporation was founded in 1994 through a partnership between the Kansas Technology Enterprise Corporation (KTEC), the Wichita State University, and Wichita Area Development, Inc. Its service delivery falls into two categories: business consulting and seed capital investments. It offers a full range of business consulting services. KTEC staff consults regularly with WTC about companies that have potential for seed investment.

- Investment Fund: Wichita Technology Ventures
- Website: www.wichitatechnology.com
- Clients: Phonetics, Nanoscale, Pixius, Environmental Compliance Consulting, Global Aviation Technologies, Nutrijoy, 360wichita.com, Control Vision Corporation, Equential Technologies, Innovia Medical, LaGarde, CritiTech, Vasogenix Pharmaceuticals, Ventria Bioscience, Cybertron International, PAC*MIG, Ponca Products, Purifan, Relight America
- Outcomes: Since 1994, has invested over $2M dollars of seed capital leveraged with $50M dollars from private investors in 23 technology companies representing over 40 patented technologies. Investments have ranged from $25,000 to $200,000. 11 of its portfolio companies have received funding from KTEC and are currently in the active portfolio (NanoScale, Pixius, Environmental Compliance Consulting, Nutrijoy, Control Vision Corporation, Innovia Medical, CritiTech, Vasogenix Pharmaceuticals, Ventria Bioscience, Purifan, and Relight America). Founded the Midwest Venture Alliance angel network group consisting of over 50 members.

KTEC Structural Integrity

Statutes & Legislation

The enabling statutes for KTEC outline legislative expectations for how the corporation should be governed. TPMA's examination of how those statutes have been executed indicates that KTEC is generally in compliance with reporting requirements and the establishment of programs that respond to its mission. It does appear; however, numerous interviewees claimed that the information dynamics between KTEC and its Board do not fully support the latter in effective governance of KTEC. This conclusion is based on interviews with current and past board members, and direct observation at the December board meeting.

Execution

Provisions under Statute 74-8101

- The corporation shall be governed by a board of 20 directors
- The corporate president shall not be a member of the board

Provisions under Statute 74-8105

- The president shall be the chief executive officer of the corporation and shall serve at the pleasure of the board ... The president shall direct and supervise administrative affairs and the general management of the corporation
- ... Any officer or employee of the corporation who receives a salary allocated from state funds shall receive no other compensation including, but not limited to, salaries, bonuses, fees or incentives for performance of any duties on behalf of any entity which is a subsidiary of or is otherwise related to the corporation or is a business in which the corporation or any entity related to corporation has invested state funds

Provisions under Statute 74-8109

- Approval of the investment by the corporation may be made after the board of directors finds, based upon the application submitted by the enterprise and such additional investigation as the staff of the corporation shall make and incorporate in its minutes
- Binding commitments have been made to the corporation by the enterprise for adequate reporting of financial data to the corporation, which shall include a requirement for an annual report, or if required by the board, an annual audit of the financial and operational records of the enterprise
- In the discretion of the board and without limitation, right of access to financial and other records of the enterprise

The prescribed relationship between KTEC executive management and the Board of Directors could be strengthened in several key areas. The board's role does not appear to be one of "govern[ing] the corporation" (as is its statutory charge) but of being governed. This is not unusual in the private sector and has been the

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source of increasing concern and pressure from shareholders for greater activism and process transparency. For a public agency[10], however, the concern should be even greater.

A recent article in the Sloan Management Review[11], a quarterly academic journal published by MIT, suggests that information asymmetry is a common problem for boards that must rely on information from staff to make decisions and evaluate management performance. Information is power. The absence of an independent source of information for board members creates the potential for disengagement. At the same time, a board cannot function effectively if inundated by too much raw data. A balance must be struck.

Given today's technological tools, it should be possible for KTEC board members to answer questions about investments, for example. In fact, KTEC has been encouraged over the years[12] to do a better job tracking numbers and has almost completed implementation and testing of a new software system that will make it possible to consolidate available figures from across the KTEC network. This system may offer a unique opportunity to re-engage the board and provide vital oversight information and KTEC should be acknowledged for taking this step.

The Board is underutilized as a champion for KTEC achievements if it does not have adequate details about companies in the KTEC portfolio. With a finite number of companies in the portfolio – 46 active as of March 2009 – inserting job figures in the company profiles that TPMA has already developed should not be too onerous. The financial assistance application companies complete to request funding through KTEC requests information about jobs in the non-confidential section of the application. This is information that is useful to board members to encourage informed decision-making. It is a missed opportunity for the participants and the State of Kansas if the individuals gathered in the room to make decision do not have adequate information to make those decisions.

The size and composition of the board – 20 directors – might well contribute to a certain sense of complacency. Smaller boards encourage a greater sense of ownership because each participant has a higher profile. A statutory review of the board size and composition might be in order. KBA, for example, has only an 11-person board of directors.

The statutorily determined structure of the board may be politically successful, in that various stakeholder groups are assured representation, but we question whether the structure and the compensation policy (voluntary) for board members guarantee the best possible board to oversee technology-based economic development in Kansas.

This is not to denigrate the enthusiasm, optimism, integrity, experience, or generosity of board members. All board members interviewed by TPMA expressed deep and abiding commitment to the State of Kansas and its economic growth. Several, however, did express concern that they did not feel well-enough informed about technologies being presented for consideration.

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[10] In 1993, the Kansas Attorney General determined in Opinion 93-62 that KTEC, Kansas, Inc., and the Information Network of Kansas (INK) that "while these entities have the basic characteristics of private corporations, the legislature has determined that in the exercise of their statutory authorities and powers, they are to be deemed as performing governmental functions.

"This office has previously opined that members of the boards of directors of the Kansas technical enterprise corporation (KTEC) and the information network of Kansas (INK) are covered by the provisions of the tort claims act. Attorney General Opinions No. 86-155, 92-104. In Opinion No. 86-155 it was found that the language of the statute creating KTEC was lifted from K.S.A. 68-2003, the statute creating the Kansas turnpike authority, and that the Kansas Supreme Court has held that the turnpike authority is "an arm or agency of the state, created by the legislature to perform an essential governmental function." See e.g. Woods v. Kansas Turnpike Authority, 205 Kan. 770 (1970), and cases cited therein. Based on these foregoing Attorney General Opinions and the similarities between the KTEC, INK, corporation for change and Kansas healthy kids corporation, we believe the provisions of the Kansas tort claims act are applicable to the members of the board of directors of the corporation for change and healthy kids corporation."

[11] The *MIT Sloan Management Review* is the peer-reviewed quarterly research journal from the Massachusetts Institute of Technology (MIT) Sloan School of Management. *US News & World Report* ranked Sloan 4th among U.S. graduate schools of business in 2008. Its journal is a source of useful and innovative ideas for business leaders, keeping them informed of the latest trends in corporate strategy, leadership, management of technology, and innovation.

[12] See, for example, LPA 2008, 2004; Kansas, Inc. 2007, 1996.

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A suggestion from TPMA to KTEC executive management prior to the December board meeting that board members needed a technology glossary was responded to immediately. Board members received a glossary of terms and acronyms at the start of the board meeting. We appreciate the KTEC staff members' quick attention to this suggestion. (Note: as a courtesy to the KTEC Board, a 'technology-based economic development primer' is included as an attachment to this report)

KTEC does take board members on tours of facilities run by investment recipients. The concern expressed, however, was that the tours are so quick, so full of new information for which little foundation has been laid, that at least some board members remarked that they were a bit overwhelmed, rather than informed.

While board members expressed confidence in the integrity of the investment analysis presented to them, they also expressed a desire for more detailed information and adequate time to comprehend more fully those details, saying that information was presented to the whole board in a package. A few said they might be ill-equipped with a response when asked by a neighbor about the reason for a particular investment decision.

The appearance, at least, is that KTEC executive management controls board member access to information. Some analysts have suggested that if information asymmetry exists it is inconsistent with highest performing boards:

> Private equity companies claim they know "best practice." Private equity partners, in an effort to assert their claim to an investor premium, argue that their companies enjoy success not only because of improved strategic positioning and increased operational efficiencies but also because of superior governance. Private equity ownership, they maintain, improves governance, whereas public companies' weak governance and oversight undermine the value of the company. According to this scenario, private equity's success creates a competitive benchmarking opportunity for publicly traded companies, which import private equity governance best practices.[13]

Some board members also said they were restricted from seeing certain investment information because of nondisclosure agreements with the investee. This does not appear to align with the board's fiduciary responsibility and right of access to the corporation's books.

KTEC executive management distributed board books at the beginning of the board meeting in December, which may have limited discussion due to insufficient preparation on the part of board members. Likewise, the agenda distributed prior to the meeting did not include details about speakers or time allocation, but only general topics. While one advantage to this approach is that meeting facilitation is simplified and schedules can be adhered to, a significant disadvantage is that board members questioned few of the assumptions and recommendations.

In response to one board member's repeated attempts to unbundle a package of KTEC Holdings allocation recommendations submitted for a vote and stimulate discussion about whether the proposed distribution of funds was optimal (given the State's challenging financial condition), KTEC executive management said, in effect, that "the funding package was the funding package" and offered to remove the budget package from discussion that day, rework the allocations, and then present a revised package. Interactive discussion was squelched.

Another board member reminded the group about the legislative proposal to abolish KTEC in 2001[14] and cautioned the group against voting for initiatives that could be construed as creating new programs during a State budget crisis by saying, "You will have to live with the consequences."

[13] Business Ethics and Public Policy, Governance, How Boards Can Be Better — A Manifesto, By Robert J. Thomas, Michael Schrage, Joshua B. Bellin and George Marcotte. Sloan Management Review. January 7, 2009

[14] Legislation was introduced during the FY 2001/2002 budget process to abolish both KTEC and Kansas, Inc.

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An additional board member strongly encouraged that extra funding to centers of excellence be designated as an exception, for one year only. Yet another board member, the head of the Audit Committee, recommended not starting anything new and noted that the KTEC Pipeline Entrepreneur-in-Residence program had already been reduced to zero. He recommended looking at the four KTEC Holdings budget items to determine which held the most bang for the buck[15].

Admittedly, changing any single group's dynamics represents a challenge. However, there is a risk in accepting a condition of relative ignorance, especially for a board that is charged with monitoring, indeed, with "controlling" the operations of the corporation. Superior governance is essential to sustainable success as superior operations and the KTEC board must determine how its performance is to be measured. These metrics should align with those used to measure corporate performance. This may be especially important for a quasi-state corporation that receives 100 percent of its operating budget from the State, but which purports to model itself after private industry.

KTEC executive management has frequently referred to its internal modeling as a private sector entity intended to encourage creativity, innovation, and agility – terms not often enough characteristics used to describe governmental bureaucrats. Unlike private equity companies, however, compensation (and at a significant level) is guaranteed by the State. There is no apparent risk to poor performance. In fact, there was historically no recourse for auditing employee performance. A 2006 LPA study found that, up to that point in time, performance evaluations were destroyed after bonuses were awarded.

The board is charged with approving the compensation for executive KTEC management. The level of compensation for executive KTEC management has come under scrutiny several times over the years. After some unrest in the legislature regarding the precedent that a compensation plan which included merit bonus pay for performance might create, in 2006 the Board voted for a compensation package that provided a salary rather than salary plus bonus, thus creating a new baseline for the president's salary closely aligned with the market for the president's total compensation. According to a letter written by the co-chairmen of the KTEC Board's Compensation Committee[16], appropriate processes were followed.

Compliance

TPMA used a set of questions derived from provisions contained in the statutes to guide its evaluation of whether KTEC and its Board are in compliance with statutes in three areas: reporting and monitoring, investment decision process, and center of excellence review. TPMA's findings for each of these areas, followed by the relevant questions, are discussed separately below.

Reporting and Monitoring

KTEC fulfills the statutory requirements for reporting, but we believe there is room for improvement. As of February 2009, only the KTEC annual reports for 2006 and 2007 were posted to the KTEC website. It would be helpful and informative for citizens, legislators, and government officials if all annual reports were available electronically. Moreover, while the annual reports describe program highlights and the distribution of funds adequately, they do not offer much analysis of changes needed from state government.

As discussed previously with reference to the 2008 LPA and RTI reports, the number of jobs created as a result of KTEC involvement is difficult to count. Companies that benefit from KTEC services frequently have benefited from assistance from other agencies as well. Changes within the broader economy factor into job creation as well. One metric that could be reported and followed consistently would be the variance between a company's

[15] The response was that the president of the corporation did not want to parse the package, although he did order the priorities upon persistent request: 1) Federal funding/SBIR, 2) High school students, 3) Clean tech, 4) business incubators.

[16] See Appendix D.

actual number of jobs and projected number of jobs. This would provide information about how specific companies are doing and would require KTEC's insistence – without exception – that the simple KTEC survey be completed annually by companies that receive financial assistance.

The Angel Tax Credit statutes were amended in July 2007 to extend the period of available tax credits for bioscience companies to 10 years. Employment levels for these companies are tracked for the length of the tax credit statute. KTEC should also consider reporting in greater detail about the quality of the jobs created, especially by bioscience companies. These companies attract highly qualified professionals to Kansas, as perhaps indicated by Kansas' impressive ranking on the State New Economy Index: 15th in the U.S. for workforce education and 10th in immigration of knowledge workers. The quality of jobs created may be more meaningful for Kansas' future competitiveness in the innovation economy than the quantity of jobs created. The KTEC application that companies complete to initiate the assistance process requests job information under the section designated for public disclosure. Thus, it does not appear as though job figures are treated as "trade secrets."

The KTEC staff has a responsible process in place for the Angel Tax Credit program to ensure that those companies requesting qualification for credits are eligible. Companies have tried to take advantage of the program by presenting themselves as being domestic (in-state) Kansas residents, but were denied when KTEC staff due diligence revealed that their in-state presence was limited to P.O. Box, for example.

The questions that guided this evaluation of KTEC's compliance with statutory reporting and monitoring requirements are listed below.

1. Annual Report: What is the distribution of the annual KTEC report (74-8111)? Does it note the changes needed from state government? Does it show how and at what level other states fund similar programs?
2. Job Creation: Do angel investment tax credits meet the legislative intent for jobs creation (74-8131 "Kansas businesses, which are job and wealth creating enterprises")? 74-8135 requires "reasonable potential to create measurable employment." Are companies being surveyed over a long enough period? Are job numbers considered "trade secrets under the uniform trade secrets act"?
3. Bioscience Company Monitoring: 74-8134 indicates that investments in bioscience companies must have been in operation for less than 10 years?
4. Angel Investment Tax Credits: 74-8136 identifies KTEC as the administrator for state tax credits, the purpose of which are to "assist in the creation and expansion of Kansas businesses which are job and wealth creating enterprises ... Such tax credits shall be awarded to those qualified Kansas businesses which, as determined by KTEC, are most likely to provide the greatest economic benefit to the state." Businesses that do not satisfy annual reporting requirements may be "undesignated." Are there any instances of a business losing tax credit qualifications for noncompliance? In addition, KTEC determines the payback amount due the State for noncompliance, including companies that move out of state within 10 years. Are there any instances of this?

Investment Decision Structure and Process

TPMA has determined that the financial assistance decision-making structures and processes instituted by KTEC and its Board of Directors comply with the statutes. We have noted that in the past there appear to be instances where actual practice has fallen short. This was more prevalent during KTEC's "learning phase" when investments were made in companies that, at least in retrospect, do not appear to represent technological innovation. The investment decision-making process itself is discussed in greater detail in Section V. KTEC staff leverages the KTEC network to ensure that Board members have access to expertise about specific technologies directly (through briefings and on-site visits) and indirectly (through technology assessment reviews of prospective assistance recipients).

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KTEC Board members who are on the Investment Committee are privy to comprehensive background information about investment prospects and their underlying technology. According to KTEC staff, Investment Committee membership is open to any Board member. In discussing comments made during the interviews that the investment process appears to be opaque to non-Investment Committee members, TPMA suggested to KTEC staff that invitations to Investment Committee meetings be sent to all Board members to encourage attendance and broader participation on the committee. KTEC staff agreed on principle, but cautioned that consistent attendance was important, saying that the process would become less efficient and effective if Board members selected to attend meetings based solely on which companies were on the agenda. TPMA agrees that membership on the Investment Committee should be consistent so that a consistent application review process is followed and to develop the expertise among Investment Committee members.

The majority of Investment Committee members are not members of the KTEC Board of Directors.[17] The statutes also provide for membership by KTEC staff and other especially qualified individuals from "outside." All of the non-Board members of the Investment Committee are experienced and successful angel investors in their own right. TPMA observed that membership on the Investment Committee is very consistent year to year with respect to non-Board members: the same individuals are present year after year. Meanwhile, Board member participation as Investment Committee members has varied from 14 percent to 29 percent. This lack of participation on the part of Board members understandably leads to a concern that decisions are being made by a select group of individuals. It is important for succession planning and capacity-building that new people be brought onto the committee. This will also help allay suspicions of favoritism and lack of transparency – that the Investment Committee is a closed group of individuals. It would benefit the State of Kansas to build more depth into the Investment Committee by encouraging new members (thus building expertise) and requiring a certain minimum number of members from the Board (thus building capacity and making the process less opaque to Board members).

KTEC has implemented, and consistently maintains, an excellent computer-based tracking system that signals staff about critical dates pertaining to items like clawback provisions and investment position. Companies applying for financial assistance are also asked to sign the Investment Compliance Agreement[18] before receiving funding. It is imperative that this process be followed. Indeed, a company's refusal to sign may be an indication that KTEC's assistance is welcome, but not "instrumental" to the success of the company or that "commercially reasonable" funding is otherwise available (both as provided for in K.S.A. 74-8109).

TPMA analysts referred to the following statutory provisions to guide evaluation of KTEC's financial assistant decision-making structures and processes:

1. Board access to financial and other records of enterprises in which KTEC invests is required per 74-8109. Has the board successfully requested this information?
2. How are experts "recognized by their peers for outstanding knowledge and leadership in their fields" selected to participate on the investment committee?
3. Per 74-8109, the board of directors is to "create an investment committee."
4. Are conditions for awarding grants (ARMF and TCSF) being met? (74-8107)
    a. Cost share documentation
    b. Description of future commercial application, industrial sector, job creation potential
    c. Itemized research budget, time line, research methodology
    d. No money for training or technical assistance
    e. Will expand the field's technological base within the state

[17] A list of the FY 2008 Investment Committee members is in the Appendix E
[18] See Appendix F.

f. Enhance employment opportunities

g. Measurable result

5. Are conditions for purchasing qualified securities being met (74-8109)?

a. Enterprise has a reasonable chance of success

b. KTEC's participation is instrumental to enterprise success or retention in state

c. Funding not otherwise available on commercially reasonable terms

d. Reasonable potential to create substantial employment within state

e. Entrepreneur and founders are contractually committed

Centers of Excellence

TPMA found that KTEC's biennial review process for the Centers of Excellence is consistent and fully compliant with statutory requirements (K.S.A. 74-8106). KTEC's funding contribution to the centers is highly leveraged, well beyond the requirements of the statutes. Details about the review process and funding are in the University Programs section of this document. The following two questions guided TPMA's evaluation of KTEC's statutory compliance with respect to the centers:

- Are biennial reviews conducted? (74-8106)
- Is at least 50 percent of centers' funding above established level of core funding matched by non-KTEC sources? (74-8106)

Funding Mechanisms

Centers of Excellence

As initially conceived (K.S.A. 74-8106), KTEC would establish three different types of funds for supporting three categories of Centers of Excellence: basic research, applied research and development, and technology transfer. This provision for segregating center funds was not implemented. The LPA, as part of a broader study, looked at this pragmatic, albeit noncompliant, practice and agreed with KTEC's current method of financing centers.

SBIR Matching Grant Program

The KTEC Small Business Innovation Research (SBIR) matching grant-bridge financing program (K.S.A. 74-8108) was inoperative for several years. Instead, KTEC provided non-financial assistance to those seeking federal SBIR funding. In 2008, KTEC announced that it would collaborate with the KBA to establish a reinvigorated SBIR program with some matching grant moneys made available. The RTI study showed that Kansas ranked near the bottom of its peer group of comparison states in terms of SBIR awards per 10,000 establishments (for the years 2001 through 2005).[19]

[19] RTI, p. 25.

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Section IV – Stakeholder Perspectives

Interview Methodology

Qualitative data gathering is an important complement to quantitative data gathering, and is especially valuable for researchers who have not gathered information by actually participating in the institutional and individual dynamics under analysis. These dynamics influence both the structure and content of policy formulation.

To understand more fully the linkages and gaps among the TBED stakeholders in Kansas – their perceptions about relationships within and across key organizations and programs – and to differentiate apparent and real relationships that can be deduced from quantitative data, TPMA used a hybrid interview approach. Questions were structured so that common information was requested from all interviewees. Based on the individual's relationship with KTEC, however, additional questions were posed to investigate more sensitive and subtle ways in which KTEC programs and processes have had an impact on TBED in Kansas. Those more extemporaneous questions were suggested, in part, by the interviewee's own responses. The researchers relied on their TBED subject matter expertise generally, and the documentary evidence of TBED in Kansas specifically, to investigate further:

- Who was affected by KTEC programs? How? Why?
- What was the business context?
- How can TBED policy be improved?
- How can TBED process be improved?
- What performance measurements should be used to evaluate program and policy effectiveness?

TPMA selected respondents from a pool of 254 interview candidates. Deliberate efforts were made to ensure a broad and balanced representation from those knowledgeable about the Kansas economic development community:

- Private industry (those who requested funding, including both those who received technical and/or financial assistance and those who did not)
- University researchers and administrators
- Technology incubators ("residents" and administrators)
- Elected and appointed public sector officials
- Analysts (within government and private sector, including some outside Kansas)
- Economic development officials

TPMA researchers used a combination of specific (pre-determined) and spontaneous questions to explore the perceived strengths and weaknesses of past policies and programs, and to elicit practicable and measurable recommendations for improvement. Researchers also asked interviewees to recommend TBED programs, policies, and performance measurements that might serve as models for Kansas. Researchers took interview notes manually and followed commonly understood ethical codes of behavior for obtaining and recording respondents' comments, while maintaining assurances of nondisclosure in the summary interview notes given to Kansas, Inc. Permission to attribute specific quotes was obtained by TPMA researchers in writing. Final selection of interview candidates was partially determined by respondent availability in accordance with the time constraints of the KTEC evaluation project.

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KTEC Interview Themes and Commentary

During the months of November and December 2008 and continuing into January 2009, the TPMA team conducted interviews with over 80 stakeholders that included current and former KTEC board members, entrepreneurs (who have received and who did not receive funding), state and elected officials, former and current staff members, participants in the Pipeline program and other stakeholders. A copy of the set of questions that were used is included as Appendix B to this report. Interviewees were promised anonymity; what follows is a compilation of themes derived from the interviews and commentary for the evaluation staff.

The purpose in conducting these interviews was to create a qualitative foundation upon which a substantive, quantitative evaluation of KTEC might be constructed. While qualitative reviews are often dismissed as subjective, anecdotal, and therefore inconsequential, we have always found that 'facts' are often what people believe them to be and that perception, right or wrong, becomes a form of reality.

For an operation as extensive as KTEC's that has engaged many people over the years, it is important to understand from their recollected experience how the organization is perceived, what factors power those perceptions and how perceptions help or hinder the organization's operation.

What follows are some over-arching themes that emerged during the interviews. To warrant mention as a 'theme' in this document an idea or concept had to be represented by a number of interviewees or be a recurring topic noted across a number of interviews.

Interviewees' Overall Ratings of KTEC

Interviewees were asked to indicate if their interaction with KTEC had been generally 'satisfactory' or 'unsatisfactory' and were then asked to explain why they answered in the manner they did.

71 percent of the interviewees indicated that their impressions of and interactions with KTEC were satisfactory. 16 percent indicated that their interaction with KTEC had been somehow unsatisfactory and 8 percent did not answer the question. The remainder of the interviewees was either KTEC or state staff or had some other role specific to KTEC.

Reasons offered for a satisfactory response range from the personal, e.g. entrepreneurs who received funding or direct assistance, to more generic responses. It appears from some of the satisfactory responses that a number of the stakeholders who were interviewed for the project lacked a detailed understanding of the mechanisms necessary to support technology-based economic development and were unable to offer specific reasons for their answers. Therefore, their satisfactory answers tend to reflect a relative lack of comparative perspective rather than a substantive evaluation of KTEC and its impact.

Nearly half of the negative responses from interview subjects came from university sources and dealt with the lack of direct support from KTEC for technology transfer activities. While a broad framework for technology transfer seems to be in place, the framework is not sufficiently built-out to take advantage of university-based intellectual capital. The generally negative evaluation of KTEC from university-based interviewees may be a result of this.

KTEC's Role in Kansas

Few individuals seem to have a comprehensive understanding of KTEC and what it does, or is meant to do. Most interviewees know only the aspect(s) of KTEC that they have directly interacted with (Pipeline, Center of Excellence, capital) but do not see the whole of KTEC.

One aspect of KTEC that is easily overlooked is the investments in a number of technology-based companies and, as a result, its contribution to keeping them within the state of Kansas. A number of company executives noted that their companies would have left the state, but KTEC's investment required them to stay.

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KTEC has fulfilled a vital function within Kansas by working to connect and network various entrepreneurs, venture capitalists, entrepreneur support organizations and other business support mechanisms. Many interviewees identified KTEC as the 'hub' of the technology network in Kansas.

One over-riding positive contribution that people attribute to KTEC is that it provides a sense of 'one-stop' assistance for entrepreneurs. This has become a by-product of KTEC's activities, i.e. it is an unintended and unadvertised program. Because of the expertise of the staff and their extensive network, KTEC has become the place to call for entrepreneur assistance: not that they 'do it all' but that they know whom to call.

One wonders, though, whether this type of informal approach is adequate to meet the growing needs of the entrepreneurial culture of Kansas and whether a more formalized and logical form of assistance should be considered.

KTEC Board

The statutory role of the Board of Directors as a governing body could be strengthened. Some Board members who are not officers or members of the Executive or Investment Committees report that they are only allowed to operate in an advisory capacity. Many cited the lack of detailed board information either prior to or during board meetings as a particularly troublesome issue.

A number of comments dealt with the conduct of the board meetings. Some respondents indicated that board meetings seem 'contrived,' i.e. structured around pre-defined conclusions and that there is little or no substantive discussion during the meetings.

Beyond its fiduciary responsibility, the ongoing lack of engagement of the board in substantive decision-making or in providing informed counsel suggests that opportunities to advance the breadth and depth of KTEC's mission in Kansas are shortchanged. The KTEC Board is made up of 20 highly respected individuals, well qualified in their respective fields. They are a tremendous resource for promoting TBED in their respective communities, but they must be well informed to educate others and give constructive feedback to KTEC management. Rather than creatively employing the diverse experiences of the board members in charting innovative directions for KTEC and its programs, it seems as though the board is 'managed' as a way of minimizing input rather than soliciting it. In other words, the statutes give the board more power than the board has been willing to exercise.

It may be time to consider a strategic planning exercise for the board of directors as a method for encouraging the full board to become engaged in thinking creatively about future opportunities for KTEC and its role in the Kansas economy. A strategic thinking/planning process might also lead KTEC board members to benchmark KTEC and Kansas against appropriate peer organizations and states and calibrate expectations.

Kansas' Technology Clusters

With the emergence of the Kansas Bio Authority (which KTEC formed and served as interim manager during its first 18 months) and the industry trade group, SITAKS (founded by KTEC), efforts to focus on two industry clusters in Kansas has begun to formulate. Otherwise, few interviewees were able to identify KTEC's focus beyond 'technology' and with the exception of a few isolated examples could not specify areas where Kansas might develop unique intellectual and economic assets. This may be appropriate, i.e. if KTEC operates as the foundation builder and other groups such as KBA emerge to actualize specific industry assets out of the foundation work KTEC has started, but this seems to be a default strategy.

'Ag-bio' or some form of agricultural-based technology was cited by a number of interviewees as a potentially unique opportunity for Kansas that KTEC should be taking a leadership role on. Animal health and medicine was cited as an area where Kansas, particularly the western portion of the state, has assets that are not being sufficiently exploited.

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Only a few interviewees in or near Wichita identified Kansas' pre-eminence as an aviation manufacturing and technology center as a strategic opportunity. Yet the industry seems to be one where Kansas has unique assets that could be exploited.

Interviewees also expressed hope that KTEC could become more of a platform for cross-technology collaboration, e.g. ag-bio and green energy, or soy technology and polymers or helping to facilitate cross industry collaborations, i.e. composite materials from aviation with biotech applications.

'Hope' that KTEC can become a platform for collaboration across technologies and industries is not a viable strategy for Kansas going forward. That KTEC has not previously served as a convener or has not stimulated focus within Kansas' technology clusters suggests that there may have been lost opportunities in not capitalizing on unique intellectual assets in the state or that time, energy, and financial support may have been leveraged inadequately due to lack of concentration on areas where Kansas could excel.

KTEC Staff Leadership

It is telling that many of the same qualities are identified as both praise and criticism of KTEC staff leadership depending on the individual. Supporters note that entrepreneurship is a 'hard sell' and without an aggressive approach, entrepreneurship will be shortchanged in Kansas. Others see management aggressiveness as an example of personal aggrandizement.

A second set of comments deal with the leadership style at KTEC. From an outsider's perspective, hearing comments about the leadership style at KTEC, one could conclude that there is a potential disconnect between leadership qualities necessary to champion a for-profit entrepreneurial enterprise and those qualities that lead to success in the public sphere of KTEC. The board will continue to be faced with a challenge when trying to foster leadership that can successfully straddle a functional understanding of the innovation economy and entrepreneurship while also possessing the capacity to navigate the nuances of a statutorily commissioned not-for-profit organization operating in the public spotlight.

Again, it is the responsibility of the board to govern the corporation. The board, however, seems to have chosen to remain in the background. This is not unique to KTEC: private sector boards have come under increasing scrutiny for being too passive. The consequence is that decisions, whether about executive compensation or capital investment, are perceived as not under the control of KTEC board members. This may contribute to a perception that KTEC is the domain of the few, rather than a resource for the many.

KTEC Programming

Program participants are almost universally positive about the experience and support they have received through KTEC programs. The KTEC Pipeline program receives very positive reviews from participants. Entrepreneurs who have received the benefit of seed capital investment, whether directly through KTEC involvement and/or introduction or indirectly through angel investment tax credits, are positive about both the end result of the process (capital) but also the process used to validate and vet the business. Receiving a positive endorsement by KTEC, with or without funding as a result, is perceived to be a 'stamp of approval' to venture capitalists.

There does not seem, however, to be a strategic progression of programming that could be viewed as a way of moving entrepreneurs along a logical trajectory through the stages of starting and developing a company. For example, while the Pipeline program deals with a number of aspects of running an entrepreneurial company, it is designed for entrepreneurs who are already in the midst of establishing their enterprises. There does not seem to be concerted and accessible opportunities for entrepreneurs at various stages of the business lifecycle.

As noted earlier, KTEC staff is at the center of an informal entrepreneurial support network, but it is unclear how potential entrepreneurs access this network and whether this level of informality will serve Kansas'

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entrepreneurs long-term. It is hard to assess the lost opportunities that may have already resulted from the relatively obscure 'front door' to entrepreneurial support services.

KTEC Operations

For a variety of reasons, some interviewees referred to KTEC as a 'black box:' this description was used by a finance applicant and a board member, referring to different interactions with KTEC, but referencing the same underlying cause: procedures at KTEC are not transparent. While the use of the term "black box" was not universal, more than occasional references were made to difficulties with getting information from KTEC or with understanding how decisions were made within the organization.

KTEC is occasionally criticized for lack of promotion and lack of marketing. This lack is interpreted in a couple of ways: one, KTEC is too busy focusing on its mission to spend time 'self-promoting,' or, two, KTEC leadership is confident enough to believe that they do not have to communicate their activities to outsiders. Either way, lack of information to the general public or even to interested stakeholders unnecessarily creates suspicion and conflict about KTEC's mission and progress.

Lack of communication was mentioned as a particular problem with respect to the Kansas legislature. While legislators serve on the KTEC board, there is a concern that KTEC staff does not provide extra effort to inform, educate, and explain KTEC's mission and progress to legislators.

KTEC Progress

A majority of interviewees indicated that without KTEC, Kansas' present and future economic prospects would be significantly diminished, particularly in the area of technology-based economic development. There is a general sense that the creation of KTEC has enabled Kansas to get in and stay in the "technology game."

Creation of the Kansas Angel Tax Credit, for which KTEC was a principal champion, is seen as a positive step for Kansas and has provided significant capital for start-up companies in Kansas. The unique structure of the program, a direct tax credit to the angel investor, has served to mobilize new capital in the state.

Few interviewees were able to articulate success metrics for KTEC or if KTEC was making measurable progress on specific items. With regard to the 'progress' question, most interviewees indicated their belief that KTEC is making progress in fostering technology business in Kansas, but were often unable to point to specific indicators that are or could be used to measure progress. This creates an opportunity for KTEC to better calibrate its message and make a renewed effort to increase communication to stakeholders.

Likewise, when interviewees were asked to put the mission of KTEC 'in their own words,' almost all were able to articulate KTEC's function of 'growing technology businesses in Kansas,' but there was often little specificity beyond that phrase.

A number of interviewees raised the rhetorical question about return on investment on start-up companies versus investing the same dollars in attracting or growing existing companies. No one had or has an answer to the question, but many interviewees were grappling with this question, particularly when they could not point to specific tangible outcomes from KTEC. This is typical for technology-based economic development but should be a call to KTEC stakeholders to better track and articulate ROI.

Another theme that comes across from many interviews is that KTEC is perceived as trying to be 'all things to all people.' In this model, there is never enough money to accomplish everything and as a result, some individuals end up being marginally disappointed. The alternative is to focus more exclusively on some defined opportunities and within specific industry sectors to manage expectations over the long haul and direct finite resources to have an impact.

University Support and Tech Transfer

Concern emerged in the interviews about whether KTEC is providing appropriate leadership for commercialization of university research. Some interviewees noted that KTEC is well positioned to serve as a convener across universities, yet has not fully taken advantage of its position to do so. Expertise regarding commercialization is uneven across universities in the state and the learning curve is both steep and expensive. Finding ways for universities to share expertise, experience, and even cross-generate research is viewed as an appropriate role for KTEC, but one that is not receiving sufficient attention or support.

Lack of reference to Kansas' universities across the interviews was surprising and somewhat disappointing. Unlike in other states, the universities were not often cited as the drivers for Kansas' technology future and when they were, the citations were occasionally inaccurate, i.e., identifying technologies that were not prevalent at Kansas universities or identifying areas where Kansas does not have competitive pre-eminence, such as certain life science technologies.

In almost all cases where states and regions have emerged as entrepreneurial powerhouses, university research is the fuel that propels the business-creation engine. With the exception of the KU Med Center, university research failed to register as an opportunity with many of the interviewees.

Perspectives on Other States' Activities

When asked about technology activities in other states, a large percentage of interviewees were unable to identify specific opportunities in other states that KTEC should emulate or that could serve as benchmarks. Of those interviewees who named states that Kansas should compare itself to, Oklahoma was the state most often cited. That the state most often mentioned is a neighbor to Kansas, and that few specifics about Oklahoma's programs were offered, seems to suggest insularity among KTEC stakeholders.

Other states mentioned during the interviews were:

- California (San Diego)
- Texas (Austin)
- Massachusetts (Boston area)
- North Carolina (Research Triangle)
- Georgia (Research Alliance)
- Iowa
- Ohio (Cleveland, according to one)
- Illinois (especially Illinois Ventures)
- Pennsylvania
- Oklahoma
- Michigan
- Tennessee
- Wisconsin

Few interviewees were able to outline specific programs that were being offered in these states that should serve as a benchmark or 'best in class' standard for KTEC to emulate. Researching other state programs could be a project for the board, serving to educate them about TBED concepts and making them more aware of how Kansas could approach TBED more efficiently.

Additionally, this raises a concern that KTEC stakeholders have not been sufficiently oriented about appropriate benchmarks from other regions and states and have not been adequately oriented in a way that enables them to understand Kansas' real peer and competitor states. California, Texas, North Carolina, and others frequently cited are in a different competitive league from Kansas.

Perhaps KTEC can be faulted for not clearly defining and clarifying which states and regions are in the competitive tier with Kansas, what opportunities they are competing for, and what strategies and activities are critical to close any competitive gaps for its stakeholders.

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Section V: KTEC Investments, Service, Partnerships – Analysis

KTEC Investments: Analysis

> Efforts at innovation-based economic development strategies will need to be realistic about their goals and sharply focused on specific objectives. Given the small size of the state, Kansas cannot afford to take a general and unfocussed approach to innovation ...
>
> Kansas cannot afford to opt out of the knowledge economy. Nevertheless, the state's small size means that it cannot afford to invest in a diverse portfolio. Rather, it must focus on areas of existing strength. These strengths are likely to be particular niches within broader streams of innovation.
>
> The state may also need to do more to increase the availability of venture funding given the concentration of the sources of these funds today, and the resulting concentration of new businesses in close proximity to the sources of funding.
>
> One of the most significant tools in KTEC's kit is the power to channel state funds to promising entrepreneurs through grants and other investment assistance, including equity positions.
>
> – Joshua L. Rosenbloom
> "The State of Innovation in Kansas"[20]

According to statute, KTEC should play a significant role in capital formation at the seed stage. KTEC's strategy for funding pre-revenue companies has evolved over the years: from loans and grants to royalty to equity positions. The type of companies targeted has also evolved over the years. Because there is no market for the investments that make up KTEC's portfolio, companies remain in that portfolio until the company terminates operations or exits via trade sale or acquisition, IPO, or liquidation of assets. KTEC's active portfolio as of February 2009 stood at $9.147 million, with 48 active companies in which KTEC made investments between 1997 and December 2008. Over KTEC's equity portfolio investment lifetime, another eleven companies, totaling an investment of $1.798 million, terminated operations and three companies exited successfully (realized return on investments). The total of seed investment activities, according to information received from KTEC staff is $12.286 million. KTEC records show industry matches totaling $78.73 million.

A study performed for the Kauffman Foundation[21] makes the observation that a typical angel investor with a portfolio of ten seed/startup companies can hope realistically that three or four of the companies will return some, perhaps a modest, return on capital and that another three or four will, in effect, return the capital for all ten. Angel investors expect that half will terminate operations without return to investors. KTEC's portfolio has shown some positive returns – from Knowledge Communications and AeroComm. The most notable losses as of February 2009 are QuVis ($252,000 invested) and Kozoru ($667,000 invested). An in-depth look at Kozoru and other companies appears in the section on case studies.

By its own admission, "On a purely financial returns basis, KTEC historically has fared not much better than many other venture capital funds that have struggled to survive in the region in and surrounding Kansas. There have been some successes, but no Google or Dell Computer in the portfolio."[22] Kansas legislators may be asking the wrong question when they request Return on Investment (ROI) calculations for KTEC investments in pre-revenue companies. Greater clarity is needed around the role that KTEC should play in the innovation/commercialization lifecycle.

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[20] Joshua L. Rosenbloom. The State of Innovation in Kansas. Kansas Policy Review. Vol. 29, No. 1 Spring 2007. [http://www.ipsr.ku.edu/publicat/kpr/kprV29N1/kprV29N1A2.shtml. Accessed 01/16/09]

[21] Luis Villalobos and William H. (Bill) Payne, "Valuing Pre-Revenue Companies," July 1, 2007.

[22] "Twenty Year of Impacting Technology-Based Economic Development in Kansas." January 12, 2007. KTEC supplement to its annual report sent to Governor Sebelius, Kansas legislators, and citizens.

KTEC makes investments now through two instruments: Applied Research Matching Fund (ARMF) and Technology Commercialization Seed Fund (TCSF – established 2003). Between 1988 and 2006, the number of companies receiving financial assistance in a single year has ranged from a low of 9 (2006) to a high of 41 (1992). Beginning in 2002, the number of investments per year has not exceeded 13 companies. Earnings realized through KTEC's wholly owned subsidiary, KTEC Holdings, are used to augment these investment funds.

TPMA Methodology

TPMA used both qualitative and quantitative approaches to evaluate the integrity of the investment decision process. Questions were posed during interviews with KTEC stakeholders about current, emerging, and even missed opportunities to gather recommendations about areas for investment that had not been targeted. TPMA also reviewed annual reports, newspaper articles, KTEC board minutes, portfolio company application material, earlier evaluations, and other documents to understand the KTEC portfolio: types of companies, targeted industry sectors, predictors for investment performance, anomalies.

TPMA gathered data from KTEC's annual reports and newsletters and affiliated organizations' websites to understand KTEC's investments in greater detail from 2002 through 2007.[23] This covers the period of time that KTEC's strategy for giving financial assistance to companies was changing from a grant/royalty position to an equity position.

Finally, to understand how KTEC investments were distributed among industry sectors and across the State, TPMA gathered information on each company in which investments were reported between 1998 and 2008 – basically, all the investment deals that show some status in the current KTEC records (active, dead, or exit)[24]. This information-gathering exercise also provided the foundation for selecting companies for individual case study treatment.

KTEC Investments: Successes, Issues & Shortcomings

Investment success for a TBED agency can be counted on several dimensions:

- Creation of viable start-up companies
- Successful company exits that return wealth to the state
- Creation and retention of jobs, in particular, knowledge jobs
- Attraction of capital
- Increased intellectual property and research capacity
- Enhanced market reputation

Start-Up Companies

Brief descriptions of the companies that comprise the KTEC portfolio are contained in Appendix H. The KTEC portfolio as of March 2009 shows 46 active companies. Of these, 37 received financial assistance since the creation of the TCSF. It also shows three successful company exits that returned money to Kansas: Knowledge Communications, Neon, and AeroComm. Two success stories are detailed below, one that describes a successful exit (albeit an unfortunate departure from Kansas) and another that describes the organic growth of a company that "came back home" to Kansas.

ROI to State

An early (pre-TCSF) success story is Knowledge Communications. This is the story recounted by KTEC staff:

[23] Appendix G: Investments 2002-2007
[24] Appendix H: Company Descriptions

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Clint Everton, then an undergraduate student at Wichita State University, founded Knowledge Communication in the mid-1990s. From its inception, the company was assisted by the Wichita Technology Corporation (WTC), a KTEC network incubator, which provided virtually all of the business guidance and seed capital during the company's early years. KTEC also provided royalty grant funds. Knowledge's technology was originally CD-based (and ultimately web-based) corporate education and on-line technical skill products. The company grew locally to 50 employees. After a modest round of venture capital from out-of-state sources (there was no angel or early stage venture capital in Kansas at that time), Harcourt General purchased Knowledge and relocated it out of state. Ultimately, Harcourt sold Knowledge to Thomson, with Everton remaining as CEO. In 2007, Knowledge was sold to SkillSoft for $350M. Financial returns to the KTEC network were >10x, although the presence of angel or early stage Venture Capital would have likely helped the company stay in Wichita.

Job Creation

One entrepreneur interviewed attributed her company's success to financial and business assistance from KTEC and business incubator/NIST MEP MAMTC at a pivotal point in 1998. Harper Industries, based in Harper, had been purchased back by employees who needed help in planning a new product release and funds to redesign one of its two major products: all-terrain mowers, used especially for commercial applications. The company has continued to grow and, with 90 employees, is now the third largest employer in the county.

The number of jobs created as a result of funds invested is difficult to determine at this time. Too many variables exist. There does appear to be a positive relationship between the number of technology jobs in the state as of February 2009 and investment in technology-based businesses. That relationship cannot be characterized as causal, however.

Results from the 2008 State New Economy Index seem to indicate that knowledge jobs are being created in the State of Kansas. The state ranks 10th for "immigration of knowledge workers." Those workers see opportunity in leaving their home countries and relocating to Kansas. Moreover, this does not signal a dearth of native "knowledge workers." Kansas ranks 15th for "workforce education." Similarly, Kansas ranks 8th in "gazelle jobs." This metric[25] is subject to misinterpretation, however. According to the Index, "Especially in smaller states, a relatively small number of extremely fast-growing gazelle jobs can account for a large percentage of state gazelle employment."[26] Kansas, for example, is home to three companies recognized on the "Deloitte Fast 500" list (a list of gazelle companies) for recent and/or multiple years: Leawood-based Euronet Worldwide (more than $1 billion in annual revenue), Kansas City-based Epiq Systems, and Overland Park-based Archer Technologies. None of these companies received business or financial assistance from KTEC. Again, inferences about causal relationships between various statistics and metrics must be made judiciously.

Capital Formation

KTEC participated in discussions to attract Deciphera, a life sciences (pharmaceutical) company, to Kansas from its previous headquarters in Cambridge, MA. Deciphera moved to Lawrence in 2003 and raised $15 million from private investors. KTEC invested $100,000 in 2006. According to The Moneytree Report from PriceWaterhouseCoopers and the National Venture Capital Association, Deciphera raised $41.75 million in 2007 and in October 2008, announced a licensing and collaboration agreement jointly with Eli Lilly. The potential is for up to $130 million in development, regulatory and sales milestones for each of the four project areas identified in the agreement. If a product is successfully commercialized from this collaboration, Deciphera will be entitled to royalties on sales – and the State will receive a solid return on its investment.

[25] It is based on the number of jobs in gazelle companies (firms with annual sales revenue that has grown 20 percent or more for four straight years) as a share of total employment, according to 2008 State New Economy Index, p. 30.
[26] Ibid.

The table below shows the dollar amount of venture capital activity in Kansas, as reported in The Moneytree Report, from 1995 through 2008.

Figure 6: Venture Capital Activity in Kansas

Year	Venture Capital
2008	$45,469,900
2007	$82,051,100
2006	$21,486,100
2005	$1,687,000
2004	$48,682,200
2003	$24,926,000
2002	$7,438,000
2001	$40,264,200
2000	$264,826,900
1999	$30,157,000
1998	$10,400,000
1997	$9,174,900
1996	$26,162,100
1995	$6,600,000

Metrics on venture capital activity can also be misinterpreted. The Moneytree Report released in January 2009 ranked Kansas 13th in the U.S. during the fourth quarter of 2008 for venture capital activity – the number of investments made. Investors from within Kansas, however, were the sole source of that venture capital funding. Kansas failed to attract risk capital from out-of-state. Although there was a lot of activity in terms of the number of deals made, the value of each deal was decidedly lower than for deals made in other "high-performing states. Closer examination of the data shows that:

- Kansas ranked 29th in terms of venture capital dollar amounts invested (10 states received no venture capital funding in 4Q08).
- Of the top 24 "most active states" (as determined by the number of deals), the total venture capital dollar amount invested in Kansas was the least (the next state was Connecticut with $15.1 million in venture capital investment – double the amount for Kansas).
- Total venture capital investments in the U.S. reported for 4Q08 was $5402.6 million spread over 818 deals (or an average of $6.5 million per deal).
- Of the other top 10 "most active investors" in the U.S. for 4Q08, all were private venture capital firms whose total deal dollar amounts ranged from $23.3 million to $84.1 million; Polaris Venture Partners had the largest number of deals (19).

One confusing statistic in The Moneytree Report should be addressed. KTEC is ranked 10th among "most active investors" in the U.S. with 12 deals (all in Kansas) and 9th in the total dollar amount invested ($6.9 million). KTEC staff reports on venture capital investments from around the State. KTEC may thus be among the most active **reporters** of venture capital activity.

It is important to acknowledge when state money is not being leveraged to attract "foreign" capital so that other approaches can be attempted. A few of the interviewees recommended that Kansas develop stronger relationships with larger private venture capital firms from out of state.

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Here are the investment profiles for Kansas' peer states[27] for 4Q08. This quarter is being used for comparison because it was the focus of a KTEC press release (01/30/09).

Figure 7: Kansas Peer State Investment Profiles

STATE	# INVESTORS	# DEALS	TOTAL VC INVESTMENT	AVG DEAL SIZE
KS	1 (KTEC reporting)	12	$6.9M	$.58M
MO	6 (1 from MO)	10	$29.8M	$2.98
AZ	8 (1 from AZ)	7	$74.2M	$10.6
IA	2 (0 from IA)	3	$5M	$1.67
UT	3 (3 from UT)	10	$54.5M	$5.45
CO	44 (7 from CO)	49	$127.6M	$2.6
MS	0	0	$0	$0
OK	0	0	$0	$0
NE	0	0	$0	$0

The following table provides more historical perspective on venture capital funding for Kansas and its comparison states between 1995 and 2008. These figures show funding in millions of dollars between 1995 and 2008 as reported in The Moneytree Report.

Figure 8: Peer State Venture Capital Activity

	AR	AZ	CO	IA	KS	MO	MS	NE	OK
2008	0	208	812.7	46.8	45.5	86.5	0	16	17.3
2007	0.2	202.9	609.7	6.3	82	91.7	5.9	0	8.1
2006	39.2	262.6	645.4	1.5	21.5	43.7	1	1.5	15
2005	12.6	123.4	643.7	32.1	1.7	56	10	13.1	0
2004	0.1	70.7	409.2	7.3	28.7	26	4.9	0.2	64
2003	12.6	73.3	627.6	0	24.9	78.4	0.9	204.6	31.1
2002	3.7	197.4	537.2	2	7.4	76	5	12.6	33
2001	10.4	196.9	1223.3	60.4	40.3	237.4	30	90.1	29.8
2000	34.3	625.5	416.5	30.8	264.8	590.2	19.5	143.1	52.5
1999	24.9	323.4	174.4	13.9	30.1	168.2	235.7	57.3	68
1998	6.9	210.4	726.1	8.8	10.4	611	3.5	29.1	101.4
1997	4	158.1	385.3	17.1	9.1	72.1	8	3.7	27.8
1996	0	95.3	316.2	22.1	26.1	50.9	10.6	10.4	31.8
1995	5	96.1	334.2	14.2	6.6	83.3	0	0.5	6.1
TOTAL	153.9	2844	7861.5	263.3	599.1	2271.4	335	582.2	485.9

Essentially, these tables demonstrate the impact of outside investors upon total venture capital within a state. Kansas is the only state that has attempted to 'go it alone,' and is second lowest in the amount of venture capital raised. (Figure 6)

Intellectual Property

One measure of intellectual property creation used in the 2008 State New Economy Index is "inventor patents." Ranked 36th, in intellectual property generation Kansas does not rank high. Another measure, however, the "number of patents issued to companies or individuals per 1,000 workers" shows that Kansas is among the top

[27] Compilation of all peer states used in studies reviewed

movers in the U.S., having moved from a ranking of 38th in 2002 to 29th in 2008. Kansas also ranks 21st for "industry investment in R&D," a key driver of innovation and precursor for patent development.

As discussed in the section on university-based intellectual property development, patent generation is not the only path to marketable product success. Collaboration on design and testing among the five major aircraft manufacturers based in Kansas, their supply chain, and the WSU-based NIAR, for example, builds on existing strengths to develop successful innovations.

KTEC Investments: Effectiveness of Programs

One of the metrics used by KTEC to describe its impact on the Kansas economy from 1988 through 2006 is the average leverage ratio (industry investment to KTEC investment). Due to superb leverage figures for 2006, the "average leverage" is computed as 3.5:1. Based on that metric, investments performed below average for 17 of the 19 years (2004 and 2006 are the exceptions). A trend analysis would be a more reliable method of defining a benchmark for the investment leverage ratio. The mean leverage ratio is 1.9:1.

Each KTEC annual report includes numbers for the fiscal year just completed and the previous year. Each investment may not have closed by fiscal year end. Some investments may take more time to meet milestones or raise matching capital prior to closing. The audited Balance Sheet reflects the closed transactions.

While securing a funding match may be partly out of a company's control, other contingent requirements are not. An important safety provision for the State is the compliance agreement[28] that companies receiving funds from KTEC must sign. This not only confirms the commitment to respond to KTEC's annual survey about actual performance, but also defines clawback terms. Those terms provide for reimbursement to Kansas of funds received if that company moves out of state within a specific period.

Both State statute and KTEC guidelines[29] affirm that the majority of the business must be conducted in Kansas. This guideline is not always heeded. Recent examples include Neurovision (a quick search for web-based information showed it as a Delaware-registered corporation with a major operations base in Asia) and Inverseon (located in California).

TPMA's understanding is that, under the provisions of the Kansas Open Records Act (KORA)[30], certain aggregate numbers should be available for review by citizens. The 2008 LPA Report calculated investment totals for companies in which KTEC and its affiliates had invested from FY 2001 through 2008, but identified companies only by an assigned number rather than by name[31]. The explanation was that, because of the inclusion of sales information, company names were kept confidential. Only 28 of the 44 companies reporting included sales figures. While company proprietary information should be protected, it is difficult to understand why numbers pertaining to sales figures and employment should be considered proprietary when State dollars have been invested in these companies. The application form that companies complete as part of the funding request process[32] states that job figures are subject to KORA provisions. The LPA report also includes KBA investment numbers, identified by company name, along with the associated research dollars expended by the company and job figures. Without access to such job figures by company name, it is not possible to evaluate the workforce impact of KTEC-assisted companies.

[28] Compliance Agreement provided in Appendix F.
[29] Appendix I: KTEC Investment Application Guidelines
[30] KORA statutes are 45-215 through 45-223. A list of exemptions may be found at 45-221
[31] LPA Report, 2008. Appendix K, pp. 84-89
[32] Appendix J: Application form for funding

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As noted elsewhere in this study, the need for better tracking resonates throughout evaluation reports[33]. The newly formed Kansas Performance Measurement Commission (enabling legislation was signed in April 2008) was tasked with submitting a report to the legislature in January 2009, subject to progress made during meetings held in fall 2008. This report will include an assessment of the current efficiency and effectiveness of state programs. This commission is authorized to contract with a private consultant to design a performance measurement management system for the State. Barbara Hinton (LPA) has already presented to the commission examples of measurements from several states (Utah, Arizona, Texas, and Florida).

Funding Mechanisms

The amount of investment recorded for individual companies may vary from one annual report to the next because of changes in the State's funding mechanisms. . Prior to 2002, KTEC funded seven regional investment funds to be invested by the incubators locally. In 2002, KTEC consolidated investment funds at the state level to provide economies of scale. As these regional funds become inactive, they will be liquidated and KTEC will receive their share of the underlying investments. Two of these regional funds have been liquidated to date (Kaw Holdings and PITA).

Investment Decision Process

Responsible stewardship of state money is the charge that is shared by KTEC and its board. Defining what responsible stewardship looks like is difficult and relies heavily on complying with the statutes. Further, it is critical to ensure that a consistent process is followed throughout the process phases:

1. Initial identification of the investment opportunity,
2. Qualification of the opportunity,
3. Due diligence (technology evaluation, KTEC program compliance, independent market research and analysis, market strategy, credit checks on principals, management team background, financials),
4. Review and recommendation by the Investment Committee,
5. Decision by the KTEC board of directors,
6. Signing of compliance and closing documents,
7. Transfer of funds, and
8. Continued progress monitoring and reporting.

In balancing an investment portfolio and, more pointedly, when acting as steward for funds that have been entrusted by citizens, it is especially important that the decision process be consistent, defensible, and

[33] The **2008 LPA Report** (August 2008) emphasized the need for KTEC net job creation numbers. The report noted that Department of Commerce and Bioscience Authority "use detailed databases to track both the investments being made and the results of those investments," but that KTEC's tracking and information shared with its board was less complete, not linked to information about company performance, etc. Cumulative job changes are included in KTEC annual reports. Throughout the report, statements are made that job creation is probably overstated and total spending on economic development is understated (in part due to tax changes that have future consequences. The **2004 LPA Report** recommended that Kansas, Inc., KTEC, and the Department of Commerce should develop uniform standards for types of information that should be collected relating to jobs created, payroll, and other economic outcomes and methods for collecting it. The **1996 Analysis of Kansas Business Assistance** (prepared by Mikel Miller, Timothy Paris, and Charles Warren) commented on "The need to improve the accuracy, completeness,, and reliability of data collected on clients served and program outcomes, and a corresponding need to improve performance monitoring and tracking systems." [p. 1-13] The same report described the PC-based KTRAC Data Base System Information under development that will be "network ready for simultaneous use and access to all KTEC client records from all KTEC programs." [p. 3-6] The report also noted plans for computer tracking "in the immediate future" and the inclusion of outcome data: jobs created/retained, average wages of all new jobs, savings in productions, and new sales resulting from the assistance received." Issues noted were: little coordination/cost-sharing in development between agencies; lack of capacity to share data across agencies; lack of uniformity among agencies and programs in the data collected; inconsistent implementation of existing tracking systems. [p. 3-8]

thorough. The KTEC board of directors expressed concern during interviews with TPMA that their knowledge was insufficient to evaluate thoroughly the technologies presented to them. According to statute, it is the board's responsibility to request information needed to evaluate assistance decisions before the fact – and to evaluate performance after the fact. The KTEC board has appointed an Investment Committee to review investments and present recommendations to the board.

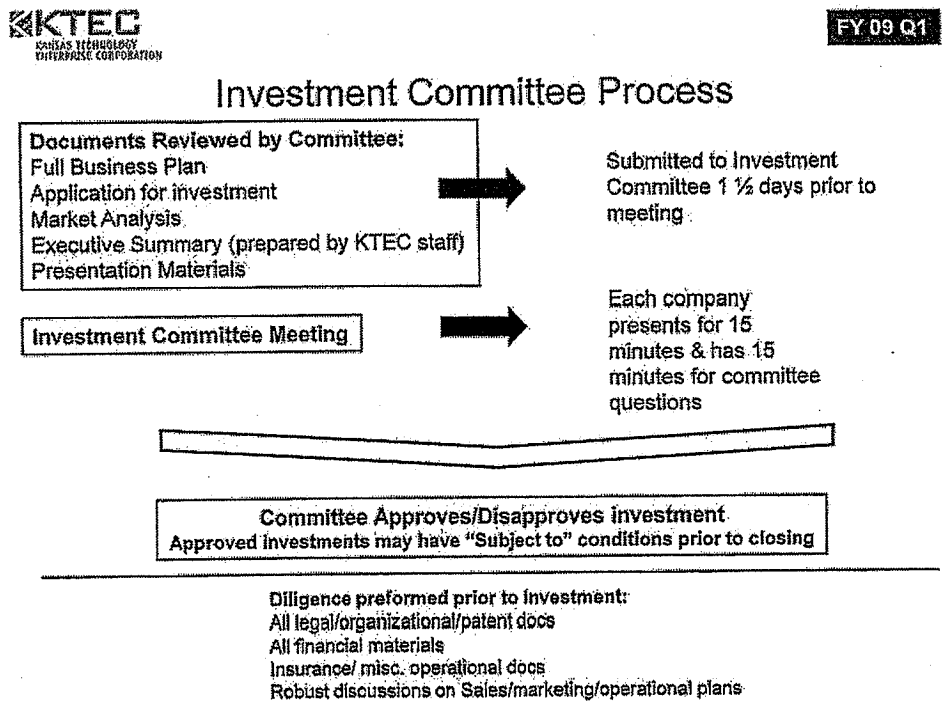
Board members did express confidence in the consistency and integrity of the process in place to review prospective investment or assistance targets. The investment decision-making process has become more transparent and consistent over time, perhaps because of expertise acquired by the KTEC board Investment Committee (IC), reduction in staff churn, improved investment tracking and documentation, open communications.

The internal KTEC staff process for reviewing company documents covers appropriate bases. The staff leverages resources within the broader KTEC community of stakeholders to bring university experts into the technology review. This provides, in effect, the peer review that is a best practice in evaluating the viability of new technology platforms or approaches. In the case of bio-agriculture firm EdenSpace, for example, a respected researcher from KSU signed the required confidentiality agreement and assisted in evaluating the opportunity without charging a fee. The researcher also spent hours with KTEC staff instructing them on cellulosic corn and its potential as a bio-based fuel.

After reading the business plan and a preliminary review, KTEC staff typically visit the company operations inviting company officials to talk about what is important to them – not according to a script from KTEC. After a successful visit with the company representatives a due diligence checklist[34], is sent to the company.

According to the process defined in Figures 9 and 10, the Investment Committee has approximately 36 hours to review company documents prior to the Investment Committee meeting. The Investment Committee members are experienced angel investors, however, and sometimes make personal investments in the same companies that KTEC funds.

Figure 9: Investment Committee Process Overview



[34]Appendix K: Due Diligence Checklist

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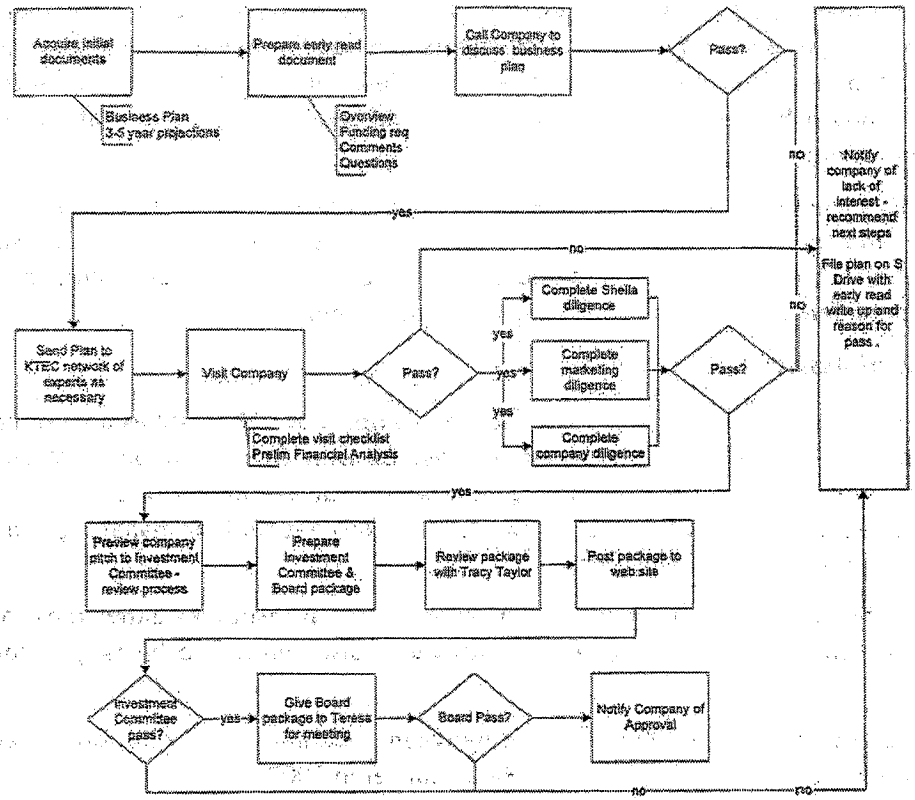
Figure 10: Investment Committee Process Flow Diagram



Investment Committee members have access to the KTEC intranet site to review company documents. Documents are posted to the site upon their receipt so that an electronic file is easily and remotely available to KTEC staff and Investment Committee members. This process change was implemented in the past three years and is part of the streamlining – and record consolidation and standardization – that is further facilitated by the new investment tracking software application.

Board members who are not on the Investment Committee or who do not attend Investment Committee meetings do not have the same understanding about the companies that they are considering. Companies are constrained to only 15 minutes presentation time and 15 minutes for committee questions. This encourages companies to instill greater discipline and succinctness in delivering their proposal.

Over the past three years, Investment Committee executive summary formats have been standardized so that KTEC board members know where to find pertinent information. The one-page document that recommends action on a particular company includes the following information:

- Company Profile
  - Management Team, Business Description, Year Founded, Industry
- Market Profile
  - Industry, Technology/Property Rights, Market Opportunities, Sales, Competition
- Financial Profile
  - Funding to Date, Current Investors, Funding Size
- Deal Profile
  - Deal Terms, Use of Funds

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Still, every effort should be made to ensure that board members have enough time to understand the company about which they will be making an investment decision. According to statute, board members should make decisions based upon thorough review of company documents and additional information generated by KTEC[35]. The board has appointed an Investment Committee to review all investment documents and make a recommendation to the board but this should not absolve the remainder of the board of its responsibility for understanding these investments.

In evaluating the KTEC investment decision process, TPMA concluded that the process now in place is repeatable, consistent, and follows recommended best practices. The process makes good use of university-based expertise to make technology assessments and can serve to build more relationships between industry and universities – and between the universities and individual board members.

KTEC Network Financial Assistance

Without a single repository of investment information for the complex of KTEC entities and affiliates, TPMA did not look separately into individual financial assistance activities with the exception of Wichita Technology Corporation (WTC). The long-awaited financial tracking application that will incorporate investment data for the past 21 years and allow reporting across the KTEC network is an excellent tool for managing and understanding state-funded seed capital investment.

TPMA did observe that the companies in which KTEC invested financial resources either most heavily or at an unusually high initial amount, or which attracted a controversy, also tended to be targets for WTC. These companies include:

- Lawrence-based CritiTech ($398,000 from KTEC between 2002 and 2007; KBA committed and paid out $264,048 in commercialization and $48,700 in R&D voucher in 2007)
- Junction City-based Ventria Bioscience ($500,000 from KTEC in 2006 –the first year it appears in a report; KBA committed $1,000,000 in 2006). 14 jobs created per LPA 2008 Report.
- Wichita-based ReLight America and its related Neon Royalty ($147,000 from KTEC between 2002 and 2007; 1996 was when KTEC made its first investment of $38,000 in Neon Royalty)
- Lenexa-based VasoGenix Pharmaceuticals ($249,000 from KTEC in 2002)
- Olathe-based LaGarde, Inc. (less notable for the $100,000 KTEC invested in 2002 than for its having burned through $6 million in venture capital money in less than a year, until filing for bankruptcy in November 7, 2008)
- Wichita-based Heartland Technologies ($150,000 between 2006 and 2007)

Consolidating state-funded investment activity in Kansas could actually increase the amount of money available by reducing the overhead cost of managing different offices. As mentioned earlier, the process is underway to dissolve small funds gradually. This could also foster a better understanding of how public money is invested and how it is differs from private investment. Risk investment, as all economic development is, is based on trust that there will be a positive outcome. No distinct advantage accrues to the State when funding is fragmented, redundant, or intertwined, and no single fund is significant enough to compete with out-of-state resources. The dark side of attracting funding from out-of-state is the terms of a deal could require that a company relocate outside Kansas.

Interviewees recommended the State consider establishing a "fund of funds," as used in other Midwestern states, such as, the Iowa Fund of Funds ($10M), Illinois Technology Development Account ($75M), Kentucky Commonwealth Seed Capital Fund ($21M), Pennsylvania Venture Capital Investment Program ($60M), or State of Wisconsin Investment Board ($135M). Another recommendation was that the Governor personally invite

[35] 74-8109(e)

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very high-net-worth individuals to join in an angel fund. The latter fund, it was further suggested, would need somewhat flexible parameters, that is, it could not restrict fund use to the State of Kansas with the expectation that the top-level investors would follow. Still another recommendation was that a concerted effort be made to court well-established venture capital firms as partners.

Concentration in KBA Areas

Investment in specific bioscience niches makes sense for the State of Kansas, due to its legacy in animal husbandry (it ranks #2 in the U.S. for cattle), agriculture, and drug delivery systems, in particular. Given the long development and approval time in the pharmaceuticals industry and the very steep risk capital requirements, it does not make economic sense to focus all limited state funds on bioscience investment to the near exclusion of other opportunities.

KTEC maintains a portfolio of investments that is diversified among industry sectors in terms of numbers of companies, but this is weighted toward bioscience companies in terms of investment dollars. While this perhaps made sense prior to KBA's full rollout, which KTEC managed very competently, it now gives the impression to some (based on comments made during interview sessions) that KTEC is an adjunct to KBA interests. In the long-run, this will not provide a balanced investment strategy for Kansas at a systemic level. Figure 11 shows the pattern of KTEC's $3.3 million investment in the biosciences sector between 2002 and 2007. All but two of the companies, Admunex and Neurovision, are still listed in KTEC's active portfolio as of March 2009. The KBA did not start making investments until 2007 so most of these investments in the biosciences were made prior to the KBA availability of funds. Moving forward, KTEC will be less involved in bioscience industry investments.

Figure 11: KTEC Investments in Biosciences

COMPANY	1ST YEAR INVESTMENT	TOTAL ($000)
VasoGenix	2002	249
CritiTech	2002	398
Proteon	2003	150
Admunex	2003	100
Inverseon	2004	250
Nexgenesis	2005	125
ImmunoGenetix	2005	250
Urigen	2005	300
Innovia	2006	300
Deciphera	2006	100
Ventria	2006	500
KC BioMedix	2007	300
Neurovision	2008	250

Bioscience firms are credited with bringing high-paying jobs with them, but the ramp-up time may be longer than in other industry sectors. It is indeed possible that the strength of this sector in Kansas helped substantiate its viability as the home of the National Bio-Agricultural Defense Facility (NBAF). The collateral benefits of that federal win will be determined over time, but its potential is stunning.

Post-Inflection Point Investments

A common concern expressed throughout the literature on economic development generally is the difficulty of definitively tying activity to job creation or retention. Even claims to the number of jobs actually created or

retained are disputed and prone to double- and triple-counting by state agencies. The 2008 LPA report, for example, discusses the discrepancy between the number of net job change in Kansas as tracked by the Kansas Department of Labor (DoL) and the number reported collectively by the four economic development agencies. The disparity in totals is notable: 47,000 net new jobs reported by DoL between 2003 and 2007 compared to reports from economic development agencies claiming more than 80,000 jobs created and more than 51,000 jobs saved.

Even if there were agreement on the numbers of jobs, the reason for job change would still be undefined. The perennial question remains unanswerable: It is impossible to know whether employment results would have been different without state involvement. Similarly, it is impossible to know whether another source of funding would have appeared had the state not intervened. A direct causal relationship cannot be established between State expenditures and job growth. Likewise, it may be difficult to link specific investments by KTEC and a company's success and growth

With respect to companies that are already on an upward track and are already attracting favorable attention or even excitement, it may be especially challenging to make a convincing claim to KTEC's involvement having made a significant difference. It may be accurate to count the job growth of a company as "growth within a client company" but it can lead to overstatement of job growth when multiple agencies claim a single company as a "client." Focusing on inappropriate metrics also clouds learning about what has and has not worked well. The quality of the jobs gained – the salary offered and education required – should be considered.

TPMA interviewed individuals who clearly credited KTEC's involvement with their subsequent growth. However, in some instances it appears investments were made in "sure bets," (i.e. companies that had already passed a certain inflection point). Some of these anomalies were noted earlier. Such 'bets' may be justified on the basis of building greater wealth for the State or the performance record of individual investment funds, but not on the basis of need prescribed by statute: to provide funding that is instrumental to the success of the enterprise and its retention within Kansas because funding is not otherwise available on commercially reasonable terms[36].

Investment in post-inflection firms might obscure investment impact in another way, as well. One of the statutory requirements is that firms receiving financial assistance from KTEC commit to certain reporting requests. Both executive management and staff at KTEC expressed reluctance to "burden" fund recipients with reporting requirements (number of jobs, for example).

Economic Impact of Investments

An irrefutable case for a cause-and-effect relationship between KTEC investment and subsequent impact to the state's economy cannot be made. Necessary supporting data is unavailable or inadequate. At times, claims for credit appear inflated. There may be underlying reasons for this.

On the one hand, it is in the State's interest for investments to be made in companies that hold a high probability of delivering some positive return on that investment. On the other hand, such investments may be problematic because:

- The statutory charge to KTEC is to engage in financing activities to promote technology-based economic development[37]
- The proportional contribution by KTEC is relatively insignificant and cannot reasonably be claimed as having contributed significantly to job creation or revenue growth, thus overstating KTEC's impact on the State's economy, especially if those claims extend backward in time (prior to KTEC investment)

Clearly, it is worth celebrating the success of companies like MediFlex (aka Enturia). After receiving a one-time investment of $98,000 from KTEC, -- and investing much more time, money, and effort in product development,

[36] 74-8109

[37] See Appendix A: Statutes; 74-8104(a) items 8, 16, 21, 22, 24, 26

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the Leawood-based company reached annual revenues of $100M in 2006, and was acquired by Cardinal Health for $490M in 2008. This is wonderful success. Further analysis is needed to understand what differentiates the successful investments from the less successful ones.

The case studies describe how Kansas, operating through KTEC as its agent, intervened with several Kansas companies and what their status is today. A profile of all the companies in which KTEC intervened with direct financial assistance (as distinct from those in which involvement was business assistance, as with the KTEC Pipeline program) may be found in Appendix H: Company Descriptions.

KTEC Service

The majority of those interviewed who had benefited from KTEC assistance – whether financial, business consulting, networking, mentoring – appreciated the excellent service received. Some remained enthusiastic even though denied funding repeatedly, for example, because required milestones had not been achieved. Others interviewed, who had been subject to what they perceived as unequal or unfair treatment, expressed less positive experiences. KTEC executive management should develop a mechanism for receiving critical but constructive feedback anonymously and quietly so that incremental improvements can be made and future problems averted. In like manner, KTEC should feel safe enough to declare what it perceives as deficiencies in its own programs or processes.

KTEC Partnerships

KTEC has built a service network for small- and medium-sized companies in the State of Kansas by partnering with universities, economic development organizations, and other state agencies. Although some of the partnerships were contrived through statutes when first established, mechanisms have been established to deepen relationships between and among partners. Specifically, the monthly conference call among Centers of Excellence, business incubators, and KTEC staff provides an excellent forum for sharing information and opportunities – and even solving resource problems. KTEC has helped establish multiple angel networks throughout the state and works closely with other sources of capital such as; Invest Midwest, the St Louis Arch Angels and several regional VC funding sources. KTEC also shares best practices with nationwide state agencies through its affiliation with NASVF.

Some lingering unproductive competition with other economic development agencies, however, may still hinder the best and most highly leveraged use of Kansas resources. Clearer delineation between KBA and KTEC is needed so that non-bioscience-related innovation receives adequate attention from State officials. Improved relationships with economic development groups in neighboring states, especially Missouri, should be pursued.

Section VI – Case Studies

Case Studies

As part of the KTEC program evaluation process, Kansas, Inc. requested that case studies be prepared to show the impact of KTEC involvement on technology companies in Kansas. The purpose of each case study here is to examine outcomes from different types of involvement. TPMA classified involvement as: professional development (e.g., mentoring, KTEC pipeline), business assistance services (e.g., business plan development, market analysis, and product messaging), investment services (e.g., venture capital presentation, introductions, investment structuring, and equity investment), and no assistance.

No clear input/output formula exists for economic development efforts. There are no guarantees. Consequently, it is difficult to define the relationship between money invested, for example, and number of jobs created or patents filed. One can look in the aggregate at the level of funding and note a general direction of change, but that change is often influenced by external factors. In addition, TPMA was not charged with, nor did it perform, a forensic financial audit. Some may denigrate the case studies as anecdotal, but they contain lessons for future policy and business decisions.

Consistent with its charge of understanding where KTEC was and was not successful from the stakeholders' perspective; TPMA has selected a few Kansas-based companies for analysis, including some that have flourished and some that have disappeared. All of the companies TPMA presents here experienced some form of involvement with KTEC.

The companies selected for case study treatment also reflect the geographic concentration of technology-based companies in the eastern part of the state, although other regions are represented. In terms of industry sector, TPMA has included representation from all sectors identified in the enabling statutes (74-8101 and 74-8102):

- Resource-based industries of agriculture, oil and gas
- Advanced technology industries of aviation, manufacturing, information and design
- Emerging industries of telecommunications, computer software, information services and research services

Case studies also include biosciences companies, which have continued to represent a significant percentage of KTEC seed investment (47 percent of KTEC's investments made from 2005 through 2008). Over time, the percentage of biosciences companies in KTEC's active investment portfolio should decrease, KBA should have priority for making investments in these companies.

In selecting companies for the case studies, TPMA requested and received from KTEC a list of its portfolio companies, whether active, dead, or exited. TPMA reviewed company descriptions contained in KTEC annual reports between 2000 and 2007 and in KTEC press releases and electronic newsletters.[38] TPMA also reviewed companies listed on the KTEC website as well as a sampling of KTEC success stories (sent by KTEC staff in response to a request for additional information). In addition to interviews with former KTEC staff and board members about their involvement in the investment decision-making process, TPMA also spent hours with current KTEC staff, going through the application documentation for portfolio companies and informational materials contained in the board books and sent to board members.

As is expected in economic development generally, and in technology-based economic development specifically, not all companies survived in which investments were made. According to the U.S. Bureau of Labor Statistics, the four-year survival rate for new companies is 44 percent. This may be a useful metric for gauging the

[38] A compilation of these companies may be found in Appendix H: Company Descriptions.

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performance of portfolio companies assisted by Kansas economic development agencies. According to this metric, the companies in which KTEC has invested have performed above average.

The project underway at KTEC to capture investment information systematically from the past 21 years is a significant step forward in understanding how KTEC can steward State funds more effectively. The database under development is a fine tool to guide and inform executive decision-making. It will also increase the transparency of the economic development process itself, make more feasible systemic and targeted investment strategies, simplify performance tracking and financial reporting and auditing, and build citizen, legislator, and stakeholder confidence in the integrity and fairness of assistance processes.

The investment process itself is fully described in an earlier section of this study, Section V. Based on its detailed discussions with KTEC staff and review of the file folders of documentation for the companies presented in the case studies, TPMA concludes that the process has evolved in a positive way since equity positions were first taken in 2002.

Similarly, the persistent guidance contained in the statutes should be followed. Investments should be made in companies that are based in Kansas, that will create high-quality knowledge jobs, and that commit to the standard compliance agreement (i.e., claw back provisions and progress tracking). No amount of financial or marketing due diligence will guarantee that a company will survive or that its exit will be successful. Following statutory and KTEC guidelines consistently will ensure the integrity and fairness of the process.

Companies Selected

TPMA selected five companies for case study treatment (see Figure 12). Of these companies, four hold *active* status in the KTEC portfolio; one is *dead*.

Figure 12: Case Study Companies

COMPANY	SECTOR	KTEC INVESTMENT	FIRST KTEC COMMITMENT	STATUS
EdenSpace	Life sciences – bio-agriculture and renewable fuels	$250,000	2007	Active
Kozoru	IT – search engine software	$667,000	2004	Dead
Deciphera	Life sciences – pharmaceutical	$200,000	2006	Active
CritiTech	Life sciences – drug delivery	$398,000	2002	Active
Chemidex	IT – Search Engine Platform	$253,000	2003	Active

Edenspace Systems Corporation

Sector: Life sciences – bio-agriculture and renewable fuels

Status: Active

KTEC Investment: $250,000

Location(s): Junction City, KS (HQ) and Chantilly, VA

1st KTEC Commitment: 2007

Company Overview

Edenspace Systems Corporation is a crop biotechnology company, incorporated in 1998, with projects throughout the U.S. and Japan. Its projects and products involve the use of live plants to improve human health and the environment. Edenspace has received numerous federal grants to pursue its research into using plants to detect, concentrate, and remove lead, arsenic, radionuclides, chlorides (salts), hydrocarbons, and other

minerals in water and soil. In addition to using plants to clean the environment, Edenspace research also focuses on reducing environmental contamination by developing renewable energy sources from non-food agricultural residues, such as cellulose. Cellulosic ethanol is a bio-based alternative to other transportation fuels. The feedstock for the biocellulosic fuels that Edenspace is working on is corn, sorghum, and switchgrass.

Before relocating to Kansas in 2007, Edenspace was headquartered outside Washington DC in suburban Virginia. Edenspace had achieved $1.4 million in revenue by 2006. That same year, the U.S. Department of Energy (DoE) awarded Edenspace $1,926,900 to fund development of corn hybrids. These hybrids (EnergyCorn™) were being tailored to improve yields and thus reduce processing costs for cellulosic ethanol by $1.20 per gallon. The cost of producing bio-based fuels has been a significant inhibitor to its adoption by distributors and consumers. Edenspace also signed a multi-year contract for biocellulosic fuels with its go-to-market partner, ICM. These successes required increased research capacity, personnel, and space. The facility in Virginia was inadequate and Edenspace needed a good solution that met its needs for growth.

According to CEO and President Bruce Ferguson, 12 different states courted Edenspace because of the strong future perceived in the company's technology and value: reducing the cost of cellulosic ethanol and gaining position as an economically viable ethanol source. The annual transportation fuel demand in the U.S. alone is estimated to be 180 billion gallons. Cellulosic ethanol potentially could meet more than 50 percent of that demand. Ferguson heard about KTEC through Scott Deeter, Ventria CEO and president (and recipient of KTEC assistance). Deeter encouraged Ferguson to look at Kansas more closely. In fact, Deeter opened up its manufacturing operation in Junction City in 2007.

Members of the Kansas economic development community – KTEC, Department of Commerce, KBA, and Junction City – pulled together and developed an attractive solution for Edenspace in northeastern Kansas. In addition to financial incentives, the proximity of researchers at Kansas State, the surrounding multi-crop farm community, and strategic partners (e.g., ICM and ethanol plants in Iowa, Nebraska, Oklahoma, and Kansas) convinced Ferguson that his company could grow in Kansas. Ferguson said, during his interview with TPMA, "We almost went to Iowa. It was the next best ... We knew what we needed." The KTEC press release announcing Edenspace's relocation to Kansas quotes Ferguson as saying: "The major factors in our decision," he said, "were Kansas' strong support for agricultural biotechnology and Junction City's drive and determination to create an important technology center. We believe that our new Junction City facility and development team will help to accelerate introduction of crucial new products for the ethanol industry."

In 2007, Edenspace relocated its headquarters and primary energy crop development to a 10,500 square foot facility in Manhattan, KS. The facility combines office, laboratory, and greenhouse space. A new 28,000 square foot facility is planned in Junction City, KS. When completed, the new facility will lower Edenspace's operating costs due, in part, to lower rent and its green, sustainable design (geothermal heating and cooling, natural light, and a 10,000-plus square foot green roof). The geothermal heating and cooling will provide a short economic payback through reduced use of electricity and natural gas. Edenspace still maintains a 7,700 square foot office and laboratory in Virginia from which it oversees its regulatory and intellectual property work, as well as its environmental operations.

Investment Profile

KTEC invested $250,000 in Edenspace in 2007. Ferguson also credits KTEC with helping arrange a $3.5 million series-A capital deal. Funding also came from other Kansas-based entities, including KBA, the Department of Commerce, and Junction City. Edenspace is a qualified company under the Angel Seed Investment Tax Credit program.

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Investment Decision-Making Process

Edenspace CEO Bruce Ferguson was introduced to KTEC through Ventria Pharmaceuticals CEO Scott Deeter (Ventria also uses bio-based materials for its product development). KTEC staff also approached Kansas State University to do a complete analysis of the company. University officials signed a confidentiality agreement prior to performing the evaluation. The evaluation performed by research faculty and graduate students was highly favorable and prompted a virtual meeting between the researchers and the Edenspace CEO. Because of the KSU/KTEC partnership, this expertise was available without charge.

KSU experts also spent hours with KTEC staff to explain issues pertaining to alternative biofuels with a focus on cellulosic corn.

KTEC performed an independent market analysis with the help of Kansas State graduate students that researched the market demographics, the state of the technology, and competition. The findings were posted on the KTEC Intranet along with the business plan, executive summary, presentation, and application so that Investment Committee members could have convenient and repeated access to information about the company and its prospects for commercial success.

As part of the due diligence process, KTEC staff ran a credit report on CEO Ferguson and sent its standard due diligence checklist to Edenspace before making the onsite visit to the VA facility. A copy of the checklist template is contained Appendix K.

At its April 2007 meeting, the KTEC Board of Directors approved its Investment Committee's recommendation that KTEC invest $250,000 in Edenspace.

KTEC Board of Directors and Investment Committee Members – 2007

Members of the Board of Directors

Kyle Elliott (Overland Park)

Robert Murdock (Hutchinson)

Investment Committee Members (not on KTEC Board)

Kenneth Frahm (Colby)

David Frankland (Kansas City)

Robert Harbison (Wichita)

Tom Lauerman (Leawood)

David Sindelar (Kansas City)

Executive Leadership

Edenspace has a well-balanced, geographically diverse management team and board of directors with professional experience in business as well as relevant technology. They represent a cross-section of industry sectors, including:

- Private sector – Cargill, Quaker Oats, Phytotech, independent farmer
- Government sector – U.S. Army, NASA, U.S. Navy, U.S. Department of Energy (National Renewable Energy Lab)
- Academic sector (numerous PhDs) - Kansas State University, Georgia Institute of Technology, Iowa State University

Strategic Partners

Research, Development, and Testing of EnergyCrop™

- ICM
- National Renewable Energy Laboratory (NREL)
- U.S. Department of Energy
- U.S. Department of Agriculture
- Kansas State University
- Oklahoma State University
- Michigan State University
- Crosbyton (Texas)

Market

Customers as of February 2009

- United States Department of Agriculture
- United States Army Corps of Engineers
- United States Army Tank-Automotive and Armaments Command,
- Armament Research, Development and Engineering Center (TACOM-ARDEC)
- United States Environmental Protection Agency
- DaimlerChrysler
- United States Department of Energy
- National Institutes of Health
- National Science Foundation
- United States Department of Housing and Urban Development

Post-Involvement Outcomes – Quantitative

Jobs (in-state)	28 (four additional positions currently advertised)
Federal Grants	SBIR II - $645,000 (includes matching funds from KBA) STTR II - $750,000 with Idaho National Research Lab (2008)
KBA Assistance	Received matching funds totaling $710,000 and R&D vouchers
Revenue	$4.5 million subcontract over 3 years to deliver 2,000 tons of EnergyCorn™ to ICM. Contract is related to ICM's award of $30 million contract from U.S. Department of Energy in 2008. $10 million sales backlog as of September 2008
Capital Financing	$3.5 mm Series A

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Post-Involvement Outcomes – Qualitative

University Engagement in Technology Transfer	Kansas State University Professor Dr. Forrest G. Chumley serves as Vice President, Crop Development, for Edenspace.
Highly Skilled Workforce Development	KSU graduate students participated in the evaluation of Edenspace technology and market opportunity.
Public/Private Sector Partnership	Edenspace CEO and president, Bruce Ferguson, is member of the Kansas Innovation Consortium chaired by Governor Kathleen Sebelius.

Conclusions

Edenspace is an example of things being done right and done well – excellent documentation, thorough due diligence process, company strategy and niche technology that aligns tightly with the strengths that Kansas has developed over the years. Although the company's financial success is contingent on market factors (e.g., price of "conventional" transportation fuels), the involvement by KTEC is already a success. Graduate students have had hands-on experience in evaluating technology and market opportunities for a real company. They have already participated in key processes that make up the innovation lifecycle. Knowledge has been shared across sectors. The State is benefiting from the entrepreneurial expertise of Edenspace executive management; Edenspace is benefiting from community and State support to expand its capacity rapidly.

Kozoru

Sector: IT (Search Engine Software)

Status: Dead

KTEC Investment: $667,000

Location(s):

1st KTEC Commitment: 2004

Company Overview

Kozoru was described in the KTEC 2004 annual report as "a leader in the development of search engine optimization (SEO) and programming design," but the description was premature; Kozoru had not yet developed the prototype of its technology. Serial technology entrepreneur John Flowers, founder of NCircle Network Security in the San Francisco Bay area, arrived in Kansas in 2003 and started Kozoru a year later. His intention was to develop search engine technology that would understand natural language in a more subtle way than Google and other established search engines. The company succeeded in raising more than $3 million in venture capital financing before it closed its doors in 2006.

Technology Overview

Flowers proposed a search engine approach based on question-and-answer queries rather than keywords. It differed from the results-based systems used by Google, Yahoo, and Microsoft that measure how many web pages point to another web page. In the latter, users receive a thousands of related references that must be reviewed and filtered. Flowers' proposed approach, on the other hand, would deliver more personalized responses and help users get relevant results to complex queries. These objectives were more similar to those built into InQuisit where Flowers had worked previously. InQuisit was acquired by Ask Jeeves, now Ask.com.

Investment Profile

KTEC invested $500,000 in Kozoru in 2004, the largest initial investment KTEC has made in a single company to date. This investment was followed in 2006 with another infusion of $167,000 from KTEC. Kozoru raised another $3 million from private investors, many of whom were from Kansas. KTEC also issued more than $350,000 in tax credits to the investors based in Kansas.

The investment from the combined funds was $1,686,264 for FY 2004. The Kozoru investment from these two funds –$161,264 – represents 10 percent of the investment from the funds for 2004. As noted in the footnote on page 14 of the annual report, however, an additional $338,736 was invested from KTEC Holdings, for a total KTEC investment of $500,000. It should be noted that companies receiving investments from the TCSF must match the investment at 150 percent and that TCSF investments are limited to $250,000. The ARMF lifetime investment for any one company cannot exceed $125,000 and companies must match at 150 percent.

The consolidated financial statements in the 2004 KTEC annual report however, do show the $500,000 total invested in Kozoru in 2004.

The $3,000,000 of company match consists of capital raised from private investors and others from within Kansas.

Investment Decision-Making Process

KTEC engaged independent counsel, Gilmore & Bell, to evaluate the investment process followed by KTEC in making its 2004 decision to fund Kozoru.[39] The legal firm found that neither the process nor the documentation was as complete as it could have been, especially given the unusually large investment (from KTEC's perspective) that was made and the fact that KTEC was the first significant investor in Kozoru. In fact, the KTEC records indicate that the investment was made in Kozoru in May 2004. The annual report states that, "The company began development of its SEO [search engine optimization] on July 1, 2004, and estimates it will have a prototype of the technology ready in 2005."[40] This indicates that work had not begun on the search engine prior to receiving funding from KTEC.

According to the evaluation by Gilmore & Bell, extensive interviews were pursued with Flowers and other industry experts, including other potential investors and venture firms. Indeed, KTEC staff stated in an interview with TPMA (February 18, 2009), that approximately 50 people attended the KTEC Board of Directors meeting to hear Flowers' presentation about Kozoru, which indicates a high level of excitement and awareness about the prospective company. KTEC staff also performed interest research about the technology, the founder, and follow-up contacts. The Investment Committee met with KTEC staff and Flowers, conducted its customary review, completed evaluation sheets, and made its recommendation.

Gilmore & Bell found the process deficient with respect to KTEC staff checking references submitted by Flowers, noting, "Second hand contact information relative to Mr. Flowers and his background is more prevalent in the files than direct contacts with prior employers, prior technology associates, and previous venture capital funders for Flowers' ventures." Likewise, Gilmore & Bell found the documentation incomplete with respect to both the application and the due diligence worksheet, and that "the Kozoru due diligence files are not as organized as one would like." Michael Peck, KTEC's vice president for investment and portfolio management in 2004, did travel to the West Coast to hear Flowers make a presentation to venture capitalists there prior to KTEC's decision to fund Kozoru. During his interview with TPMA (December 29, 2009), Peck did not mention Kozoru. When he first became a partner with the private-equity fund Open Prairie Equity Partners, Peck subleased office space from Kozoru.

[39] The memorandum from Gilmore & Bell to the KTEC Board of Directors that summarizes its evaluation of the 2004 investment process KTEC followed in connection with Kozoru is contained in Appendix L.

[40] KTEC 2004 annual report, page 16.

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KTEC Board of Directors and Investment Committee Members – 2004

Members of the Board of Directors

Lindsay Olsen (Prairie Village) – Chairman

David Brant (Wichita) – Vice Chairman

Investment Committee Members (not on KTEC Board)

Kenneth Frahm (Colby)

Kyle Elliott (Overland Park)

David Frankland (Kansas City)

Robert Harbison (Wichita)

Keith Molzer (Lenexa)

David Sindelar (Kansas City)

Robert Stutz (Shawnee Mission)

Post-Involvement Outcomes

After the initial round of funding, Kozoru assembled a high-level team of developers from the San Francisco Bay area and Austin, TX. Flowers also recruited David Warthen (co-founder of Ask Jeeves) and Ridgely Evers (QuickBooks) as members of the Kozoru Board of Directors. Progress on the technology was slower than had been anticipated, however. Kozoru applied for and received a second infusion of cash (approximately $167,000) from KTEC in late 2005/early 2006 but needed more to make progress.

The Pitch, a Kansas City publication, published an article in May 2006 about Flowers that questioned his stated accomplishments. At that time, Kozoru was still predicting product release in June 2006. The product released was not a question-based search engine, but rather, beta technology for *byoms* (build your own mobile search). It used PC- or mobile device-based instant messaging software to allow users to ask questions and get answers. It may be significant that Ask Jeeves also encountered difficulties with its efforts to develop a question-based search engine in 2000 and acquired alternative technology to pursue a different approach in 2001 after raising $42 million in its initial 1999 public offering.

Meanwhile, KTEC had engaged Gilmore & Bell to investigate the KTEC investment decision process. According to KTEC staff, Flowers blamed this investigation for his inability to raise additional risk capital. During this time, KTEC also let its seat on the Kozoru Board of Directors remain vacant after its assigned staff member left KTEC.

Efforts to sell Kozoru were unsuccessful. The company closed its doors in October 2006, let its dozen or so employees go, and sold the intellectual property Warthen for an undisclosed amount.

Conclusions

KTEC has developed a good investment decision-making process. Based on discussions with KTEC staff, the Gilmore & Bell findings, and newspaper accounts published between 2004 and 2006, the process should have been better documented. In this case, incomplete and poorly organized documentation made reconstruction of the events leading up to the decision more difficult. KTEC was extremely successful in gathering a group of willing private investors, thus enhancing the venture capital capacity in the State of Kansas.

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Deciphera Pharmaceuticals

Sector: Life sciences – pharmaceutical

Status: Active

KTEC Investment: $200,000

Location(s): Lawrence

1st KTEC Commitment: 2006

Company Overview

Deciphera Pharmaceuticals, LLC was established in 2003 in Cambridge MA as a drug discovery and development company. Deciphera moved to Lawrence KA that same year and raised $600K from KTEC and angel investors. This seed round allowed Deciphera to finish proof of concept and develop x-ray photographs that proved their since worked which allowed them to raise an additional $15mm from private investors in KS. In October 2008, Deciphera announced a licensing and collaboration agreement jointly with Indianapolis-based Eli Lilly. The agreement has the potential for up to $130 million in potential development, if regulatory and sales milestones for each of the four project areas are met. If a product is successfully commercialized from this collaboration, Deciphera will be entitled to royalties on sales.

Co-founders Dan Flynn and Peter Petillo saw potential in identifying and treating mal-functioning protein "switches" (kinases) in the body. These kinases can become oncogenic, leading to their malignant transformation. The company's mission is "to design, optimize and introduce 'best-in-class' small molecule switch inhibitors of protein kinases for human clinical trials and the global pharmaceutical marketplace through the use of its proprietary drug discovery technology platform, Phylomechanics. Deciphera's kinase inhibitors work target the mechanisms that render kinases oncogenic, retain potency against gatekeeper mutations, and afford selectivity profiles not easily attained by other approaches."[41]

Investment Profile

Deciphera was close to completing its goals of raising $2.6 million to support operations and research when company officials met with Sam Campbell in February 2003 about relocating to Lawrence. By December 2003, Deciphera had raised $15 million from "private Kansas sources." The National Venture Capital Association ranked Deciphera as 18th on its list of Top 20 venture capital deals of 2007. The $41.5 million accounted for much of the 2007 venture capital investment publicly recorded in Kansas. Deciphera has benefited from significant private financing also. Not all private financing appears in publicly available resources like The MoneyTree Report and is considered company confidential information.

Investment Decision-Making Process

Deciphera had two employees in 2003 when it decided to relocate from Cambridge MA to Lawrence. One factor in the decision was president, CEO, and co-founder Dan Flynn: he graduated from the University of Kansas School of Pharmacy in 1981. According to a local newspaper article, "Flynn said the company settled on Lawrence after meeting with Gary Grunewald, chairman of the University of Kansas medicinal chemistry department, and other University of Kansas officials and area businesspeople.

Flynn also met with Sam Campbell; at that time, Deciphera was already nearing completion of a drive to raise $2.6 million to support operations and research and had filed provisional patents on its technology. The

[41] Source: <www.Deciphera.com>

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technology is based on identifying malfunctioning protein "switches" that could be treated with drugs. Flynn and Deciphera vice president Peter Petillo believed their approach would be relevant for Alzheimer's and different forms of cancer.[42]

In 2003, KTEC's Board of Directors decided to make two. Because of the very early, pre-revenue stage of the company, investments were made as convertible debt rather than as equity position (similar to a loan or debt obligation that accrues interest and can be turned into equity or stock ownership as the company matures and can be "valued"). Convertible debt holders have a priority position over shareholders if the company is dissolved. As Deciphera met certain valuation milestones, this debt was converted to stock valued at $200,000, plus $26,799 in accrued interest (as of the FY 2006 KTEC annual report). Later in 2006, KTEC sold half of its stock to an inside shareholder.

In Fall 2008, Deciphera decided to expand into vacant lab space at Kansas University's Life Sciences Research Laboratory, providing it about 16,000 square feet of space in Lawrence. Deciphera also announced plans to add 10 employees over the next two years.

Executive Leadership

Three of the four members of Deciphera senior management are KU alumni. One of the external Scientific Advisory Board members is the Higuchi Distinguished Professor of Pharmaceutical Chemistry at KU.

Strategic Partners - Research, Development, and Testing

Among its strategic partners are deCODE biostructures, Inc. (Washington and Illinois) and Eli Lilly (Indiana).

Conclusions

Deciphera is an example of an excellent company that is doing important work in the State of Kansas – and for medical science, cancer, and Alzheimer's patients, and so on. KTEC's involvement in 2003 may have had a significant impact on its success or survival since it was the first money in to seed the company to provide proof that would attract additional capital. Later in 2003, Deciphera received significant investment from outside shareholders that it would have never received had KTEC not helped seed the company with its first round of investment. CEO Flynn's connections to KU were personal. (In addition to being an alumnus of the School of Pharmacy, Flynn is also adjunct faculty in medicinal chemistry.) Although near KU, Deciphera is located on property owned by a private individual.

CritiTech

Sector: Life Sciences – Drug Delivery

Status: Active

KTEC Investment: $398,000

Location(s): Lawrence

1st KTEC Commitment: 2002

Company Overview

CritiTech provides critical drug delivery and development technology for the pharmaceutical industry through its patented nanoparticle production technology by increasing the water-solubility of drug compounds. It was formed in 1997 by the University of Kansas Center for Research and the Higuchi Biosciences Center as an

[42] Chad Lawhorn. "Lawrence lands drug firm: Deciphera relocates to former Oread site, plans expansion." Lawrence Journal-World. February 11, 2003

outgrowth of groundbreaking research in Super-Critical Fluid technology conducted by Dr. Bala Subramaniam at the KU School of Engineering. Its NanotaxTM compound is directed at treating ovarian and pancreatic cancers. Johnson & Johnson is participating in product trials, according to KTEC officials, and the FDA is fast-tracking its technology.

Technology Overview

CritiTech's core technology centers on using compressed carbon dioxide as a processing medium to produce relatively residue-free and uniform drug nanoparticles and coatings by crystallizing cancer drugs into uniform microscopic particles that allow suspension of the drugs in water. This simplifies their effective administration to patients. It also enhances the drugs' storage characteristics by increasing shelf life and easing the need for refrigeration. The company also uses its proprietary technology to coat implantable medical devices such as cardiac stents for which even distribution of drug compounds on the surface is necessary and challenging.

Investment Profile

CritiTech has benefited from incremental funding from KTEC since its inception. KTEC played a key role in a $2 million capital raise. According to publicly available information, CritiTech has received funding from two of the angel investor networks that KTEC is associated with, but details are not public. The financing will be used for ongoing development efforts, which include work on another drug that would be complementary to Nanotax. CritiTech is a qualified company under the Angel Investment Tax Credit program, which is managed by KTEC. . KBA is beginning to play a more prominent role in CritiTech.

According to KTEC staff interviews and documents received in February 2009, KTEC has a 20 percent equity position in CritiTech, and shows a total investment of $398,000 in CritiTech since the company was formed. The pattern of KTEC investment in CritiTech shows more frequent infusions of money than for other companies in the KTEC investment portfolio. The dollar amounts, however, generally have been smaller than for companies in which investments have been since 2004.

	<2002	2002	2003	2004	2005	2006	2007
KTEC	$117,000	$58,900	$30,000		$42,100[43]		100,000
KBA						$48,700	$260,000[44]

Prior to 2002, a royalty agreement was reached between CritiTech and KTEC and later converted to equity. This accounts for approximately 29 percent of KTEC's current equity position in CritiTech. KTEC's investment in 2003 represented three percent of its total ARMF investment for FY 2003 and its investment in 2007 represents eight percent of total direct equity investments.

KTEC Board of Directors and Investment Committee Members – 2007

Members of the Board of Directors

Kyle Elliott (Overland Park)

Robert Murdock (Hutchinson)

[43] Includes KAW Holdings

[44] Through the Tax Investment Incentive program.

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Investment Committee Members (not on KTEC Board)

Kenneth Frahm (Colby)

David Frankland (Kansas City)

Robert Harbison (Wichita)

Tom Lauerman (Leawood)

David Sindelar (Kansas City)

Post-Involvement Outcomes

In 2004, CritiTech received a $100,000 STTR grant from the National Institutes of Health for further work on Nanotax, one of many Federal grants that CritiTech has received both before and since its involvement with KTEC. Phoenix Scientific, Inc. (St. Joseph, MO), the largest U.S. manufacturer of veterinary pharmaceutical formulations, also announced a significant financial investment in CritiTech. The following year, CritiTech announced its agreement with a major international device company to develop improved processes for the coating of implantable devices such as cardiac stents and another agreement to perform feasibility studies for the development of nano/micro particle compounds with a major international pharmaceutical company.

CritiTech announced in 2007 that it was preparing to hire 25 to 30 employees over the next three years as its cancer-fighting drug formulation works its way through the federal approval process.

The KTEC Pipeline mentoring program benefits from the participation and expertise of Sam Campbell, CritiTech CEO.

Conclusions

CritiTech represents a steady pattern of development for a start-up in the pharmaceuticals sector. Because of extended and painstaking research, product development, and clinical testing cycles, companies in this sector often require 10 to 15 years before realizing positive revenue. It shows the advantages of transferring technology from a state university, applying it in multi-disciplinary fashion (the technology was developed in the School of Engineering), the drug was developed through the Higuchi Bio Sciences Center, and the entrepreneurial approach was nurtured with business assistance from the Lawrence Regional Technology Center and KTEC. Thus, providing opportunities for highly skilled workers, building expertise in a strategic biosciences niche for Kansas, and effectively leveraging State funds that were made available on an incremental basis.

Chemidex

Sector: IT – Search Engine Platform

Status: Active

KTEC Investment: $253,000

Location(s): Overland Park

1st KTEC Commitment: 2003

Company Overview

Chemidex LLC, a $4.2 million global Internet business, was founded in 1997 to accelerate technical and sales information exchange between raw material suppliers and formulators in the chemical industry. The Chemidex cyber library ("Cybrary") fills a chemical information process "gap" by tracking raw materials, chemical sample, and technical product information. Since its operational launch in 1999, Chemidex has applied its information

exchange solution to multiple sectors of the industrial chemical sector, the cosmetics industry, and the food & beverage industry. Chemidex has customers throughout North America, Europe, and Asia. Its European operations are headquartered in Dormagen, Germany. Chemidex also partners with Brazil-based Associacao Brasileira de Cosmetologia (ABC).

Investment Profile

KTEC has provided both capital investment and tax credits to Chemidex, assisting their growth and enabling them to attract more than $4,000,000 in additional financing from a venture capital firm. In 2003, KTEC made its first investment of $100,000 in Chemidex and another investment of $100,000 in January 2005. When the Prairie Investment for Technology Advancement (PITA)[45] was dissolved, fund management returned to KTEC. The $52,639 PITA investment in Chemidex now shows up as part of KTEC's direct investment.

Investment Decision-Making Process

Chemidex became a client of KTEC network business incubator Enterprise Center of Johnson County (ECJC) in 1999, receiving market research, competitive analysis, valuation, and company financial assistance prior to Chemidex's graduation in 2004. Chemidex was also one of four KTEC network clients who presented at the 2003 InvestMidwest Venture Capital Forum. In addition, KTEC introduced the founder, Bruce Ianni, to a business professional to round out the executive leadership team and selected Ianni as one of the 2008 KTEC Pipeline class members.

KTEC Board of Directors and Investment Committee Members – 2003

Members of the Board of Directors

Doyle Rahjes (Agra)

Investment Committee Members (not on KTEC Board)

Kyle Elliott (Overland Park)
David Frankland (Kansas City)
Robert Harbison (Wichita)
Keith Molzer (Lenexa)
David Sindelar (Kansas City)
Robert Stutz (Shawnee Mission)

Executive Leadership

Bruce Ianni, Founder & CEO
Jim Dodd, President & COO
Matthew Perry, Vice President, Sales & Marketing
Henning Schwinum, Vice President, Global Sales & Marketing
Tim Kelley, Vice President, Operations

[45] PITA was one of eight for-profit seed capital companies in Kansas funded by the Kansas Technology Enterprise Corporation (KTEC). The Enterprise Center of Johnson County, (ECJC) assumed management of the fund from the JoCo Business TechCenter (JCBTC) in 1999. The fund provided limited early-stage, equity risk capital to technology-based ventures with the potential for high growth and significant returns on investment. The funds were not limited to companies based in Johnson County. All funds were expended by 2003 and the Fund management was returned to KTEC in July, 2007.

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Chemidex Customers

Chemidex customers include Unilever, BASF, Procter & Gamble, Sherwin Williams Company, and Heidelberger Naturfarben GmbH & Co. KG.

Post-Involvement Outcomes

Chemidex had already opened its Cybraries and reporting service platforms for both Paint and Coatings Industries and Adhesives & Sealants and Graphic Arts & Inks Industries in North America and Europe before KTEC's initial direct investment in 2003. Since then, the company has continued to penetrate additional geographic and industrial markets. The latter include personal care and cosmetics; food and beverage; household, industrial, and institutional cleaners; plastics and elastomers.

Chemidex has expanded sales and service operations to include offices in Europe, China, and India.

CEO Bruce Ianni participated in the 2008 KTEC Pipeline class and was named KTEC's 2008 Innovator of the Year.

Chemidex employs 50 people in Kansas, the majority of who are information technology (IT) professionals.

Conclusions

Chemidex is a good example of KTEC investment in a company that had already proved its ability to meet a market need, but benefited from KTEC's direct assistance to refine the Chemidex message and market position. Chemidex has shown steady, organic, sustainable growth in Kansas and internationally.

Section VII - Benchmarks

Success Measurements: Critical Benchmarks

The State Science and Technology Institute (SSTI) defines technology-based economic development (TBED) as "an economy driven by technology – through the creation of industries and the application of technology in traditional industries." In SSTI's requirements for a technology-based economy, the following elements are included:

1. An intellectual infrastructure, i.e. universities and public or private research laboratories that generate new knowledge and discoveries
2. Mechanisms for transferring knowledge from one individual to another or from one company to another
3. Physical infrastructure that includes high quality telecommunications systems and affordable high speed internet connections
4. Highly skilled technical workforce
5. Sources of risk capital

Also included must be approaches to develop these elements; those include:

1. Intellectual infrastructure – strengthening the higher education system R&D capacity, investing in higher education in areas of industrial relevance and encouraging greater university-industry interaction
2. Spillovers of knowledge – identifying and removing barriers to the commercialization of university-developed technology, encouraging access to federal laboratories, and providing seed funding to industry associations and technology councils that promote communication among companies
3. Physical infrastructure – improving proximity to airports, fiber optics networks, and high speed internet access
4. Technically-skilled workforce – encouraging more students to enter science and engineering fields and providing training for workers in technology-based companies
5. Capital – investing state funds in technology companies and using state funds to leverage private funds, helping companies access capital sources, and offering R&D tax incentives

Indicators of Success

True measurements of success in TBED remain a subject of contention and are debated in public and academic circles. TBED is often a "general" concept, and remains elusive to measurement. Many academic studies carefully attempt to define elements of TBED that can be measured, yet the effectiveness of those elements remains subject to criticism. For example, patent production is one item that can be measured exactly and quantitatively. The number of patents filed with the United States Patent and Trademark Office by any number of businesses and/or institutions of higher learning can be quantified, added together, and reported, as can the number of patents issued in a calendar year. Patent numbers can be reported from year to year on a "trend" basis to show progress (or the lack thereof) in "patent production," but what do the patent numbers *really* show? While it may be argued that patent production/issuance is some indicator of intellectual activity that can be connected to economic activity, many patents are, in fact, never commercialized. Morgan, et. al., estimates less than 49 percent of industrial patents are commercialized, and less than 34 percent of patents from inventors in the education sector are commercialized; and renewal rates for these patents are even lower). Therefore, since many of these "reported patents as indicators of economic progress" are merely nothing more

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than "plaques on a wall," it could be argued that tracking patents is an unreliable, unpredictable and unrealistic indicator of economic activity in a given region.

Other indicators, used by comparator states (Florida, Texas, Alabama, Maryland, Oklahoma, Utah, Washington, Tennessee, and others) include some or all of the following statistical indicators:

1. Funding – total amount of venture capital funding captured by new and/or existing companies;
2. New companies created – new start-ups created in a period of time, IPO's;
3. Research Funding at Universities – federal and non-federal over a period of time, publications, research expenditures;
4. Average wages – statewide numbers and in newly-created jobs;
5. Technology Transfer statistics – number of new inventions disclosed, number of patents filed/granted, amount of licensing revenue received, number of license agreements;
6. Graduation rates, housing starts, cost of living, tax abatements given, commercial occupancy/vacancy rates, number of corporate headquarters.

Any or all of these are used by various state government entities to track progress in TBED. It is unclear how these indicators can be used as a direct correlation to technology-based economic development

Intellectual Property as Indicator

The degree of intellectual property activity is an indicator of success tracked by most states. The Association of University Technology Managers (AUTM) publishes an annual survey comparing various statistics gathered from University, non-profit and other governmental technology transfer offices around the United States. The latest published survey data was issued in 2006.

Those key statistics gathered included the number of licenses executed in 2006, the number of patents issued, and the amount of licensing revenue collected.

Figure 13: AUTM Survey - Kansas Results

2006 AUTM Survey – Kansas Results[46]		
Licenses	Issued Patents	License Revenue
19	9	$1.6 M

How do these numbers compare with neighboring states, and where does this rank Kansas in comparison to a national average?

Figure 14: AUTM Survey - Neighboring State Results

2006 AUTM Survey – Neighboring State Results			
Institution	Licenses	Issued Patents	License Revenue
University of Utah	62	20	$16.3 M
Oklahoma[47]	22	29	$4.5 M
Missouri[48]	57	26	$14 M

[46] Institutions reporting from Kansas included Kansas State University, Kansas University, and KU-Med. Wichita State University and Pittsburg State University did not report any figures for 2006.

Overall, when compared across the entire AUTM database of 181 respondents to the 2006 licensing survey, Kansas' numbers place it in the bottom 50 (with KU-Med) and Kansas University's numbers place it in the bottom 64 respondents.

In fact, when doing a direct comparison with major state universities across the U.S., out of 42 state universities reporting, only universities in Rhode Island, Nevada, Alabama, Delaware, Montana, Arkansas, and Vermont reported lower license numbers than Kansas University. A true "peer group" for KU and K-State would be these state universities, plus some other smaller state schools. The numbers reported for Kansas institutions of higher learning (KU in particular) place them in the bottom quartile for reporting institutions for almost every category.

If one of KTEC's goals is to promote University-Industry interface, and to promote University technology transfer and commercialization activity, the generation of intellectual property remains a roadblock to success in this area.

Venture Capital as Indicator

The influx of venture capital investment is a good measurement of significant economic activity in a state. Capital dollars are necessary for the formation and continuation of business, and particularly in this economy, the growth of a state's economy will be directly tied to that state's ability to attract investment. The establishment of state venture funds, influx of out-of-state capital, and use of federal matching dollars (and the awarding of federal grant dollars, e.g. SBIR/STTR programs) all are tied directly to small business success in almost every state's reported measurements of increased entrepreneurial activity.

Figure 15: Investment Dollars by State

Investment Dollars by State (as reported by Moneytree®)	
Kansas	$602 M
Missouri	$2,240 MM
Oklahoma	$487 M
Utah	$2,729 MM
Nebraska[49]	$591 M
Colorado	$13,097 MM

In a 1999 report[50] former KTEC President Rich Bendis said, "...one way to determine whether you are successful is to look at the amount of dollars you leverage with your co-investment partners."

While there are many sources of figures for venture capital funding numbers, the Moneytree® Report was used due to the frequency with which it is cited by KTEC as a source of "good news" and reliable statistical information.

The total amount of investment dollars recorded for Kansas (according to the Moneytree® report) from 1995-2008 (3rd Quarter) is $602M, with a large amount recorded in 2000 ($264M). In 2005, virtually no deals were recorded ($1M).

[47] Oklahoma includes: University of Oklahoma, Oklahoma State University and the Oklahoma Medical Research Foundation; Oklahoma is also an EPSCoR state

[48] Missouri includes: University of Missouri and Washington University in St. Louis (St. Louis University did not report in 2006); Missouri is also and EPSCoR state.

[49] Nebraska is also an EPSCoR state

[50] (http://www.aaas.org/spp/yearbook/2000/ch16.pdf)

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Considering all the state data available for overall investment, Kansas ranks in the bottom 25 percent. 2005 and 2006 were particularly difficult years for investment in Kansas. When trends are examined, Kansas appears to have declined in ranking from a high in the 1999-2000 timeframe to a low in 2005-2006, and has returned to levels previously seen pre-1999.

Foundations of Economic Development

According to the Kauffman Foundation "new economy index" report of 2008[51], Kansas was ranked overall at 27th in 1999, dropped to 30th in 2002, dropped to 34th in 2007, and in 2008 come in at 31st. Additional indices include:

Figure 16: Kauffman Foundation New Economy Index Rankings

Kauffman Foundation New Economy Index Kansas Rankings	
Entrepreneurial Activity	Kansas ranks 41st
Inventor Patents	Kansas ranks 36th
Scientists & Engineers	Kansas ranks 39th
Non-Industry Investment in R&D	Kansas ranks 39th
IPO's	Kansas ranks 41st

Most of these markers of the Kansas economy seem to be consistent when compared to earlier Kauffman reports, and stable at their current levels or slightly declining.

However, some indicators (unique to the Kauffman report) are optimistic for Kansas:

Figure 17: Kaufman Foundation New Economy Index Rankings

Kauffman Foundation New Economy Index Kansas Rankings	
"Gazelle jobs" (fast-growing jobs)	8th in the nation
Industry Investment in R&D	23rd in the nation
Venture Capital	23rd in the nation

The measurement of "Gazelle jobs" (fast-growing jobs) placed Kansas at 8th in the nation, and industry investment in R&D ranked 23rd. The Kauffman report listed "venture capital" at 23rd, but they measure it as a "percentage of worker earnings," which is unusual and not a typical measurement used by the majority of other sources; thus, the rankings by Moneytree® are considered to be of greater significance (total dollars invested).

The "gazelle jobs" ranking is significant; this is an area of impact and an area of growth in the Kansas economy. These jobs are jobs in gazelle companies (firms with annual sales revenue that have grown 20 percent or more for four straight years) as a share of total employment. However, again, a caveat – in 2007, Kansas ranked 35th in "gazelle jobs", so these direct numbers tend to "bounce" from year to year as new companies are created and new jobs are reported. The numbers for entrepreneurial activity, overall rankings, patents, IPO's, and non-industry investments have remained more constant over the years as reported, in the mid- to high 30's and low 40's.

These items are all key measurements of economic development activity, and are important in the development of an active state economy. It is important to keep in mind that to affect these numbers takes sustained programs, time, and investment.

[51] http://www.itif.org/files/2008_State_New_Economy_Index.pdf

In the Kauffman Foundation report, and in the SSTI reports, a call to "enhance innovation" and "enable the digital revolution" is given. In addition, the key factors of providing risk capital, providing an educated, quality workforce, establishing a quality "physical infrastructure" for communications, and providing the means for the transfer of knowledge from one individual or one company to another individual or company are critical foundations for TBED. These "foundations of economic development" are measured by key metrics such as those listed above.

Is KTEC enhancing those foundations of economic development? *Can* they enhance them, given the tools they have their budget, and the time they can invest? Can *anyone* truly effect technology-based economic development?

The answer is – 'yes,' to some extent. That "extent," though, is very difficult to determine, due to the different influences on each metric, and the varying degree to which any organization can adequately affect those metrics.

Take, for example, the metric of "venture capital." The year 2000 presents classic example of imprecision, due to the wild fluctuations seen in Kansas during that year. 2000 seemed to be a good year across the entire U.S. and it may be that Kansas was simply the beneficiary of a "good overall economic climate" in the country, with a few "extra" good companies having been formed that year. Alternatively, did KTEC or any other economic development agency actually have anything to do with setting up those companies, nurturing them, and directly/indirectly attracting outside venture capital into Kansas?

There is nothing but "anecdotal" evidence to indicate anything other than circumstance during 2000. The 2005/2006 period presents and entirely different picture. There was virtually no venture capital activity during those years in Kansas – in spite of efforts by KTEC, and other agencies. Does this mean those efforts were failures or, did these agencies simply plant seeds that came to fruition in 2007/2008, or that will be realized even further down the road?

Again – there is only anecdotal evidence and a slight rise in numbers to indicate that activity changed. There is no direct proof of a change due to the actions of any particular agency, although there are occasional points where a direct investment internally (by a state agency) or a direct contact made occasionally did result in an investment – but these are rare and seldom documented. This is not unique to Kansas. Other states lament the same disconnect of direct evidence to prove actions and consequences when it comes to venture capital attraction and involvement.

While some states (Indiana, Ohio, Georgia, Massachusetts, etc.) have formed their own venture funds, they can only estimate what indirect investment has been gained by forming such funds or by making their own investments in companies out of those funds. Tracking is difficult, and many companies fail to report or they move, merge, or dilution factors increase the difficulty after several rounds of investment.

What about something as simple as "jobs created"? Again, it would *seem* to be a simple metric – but there are again many factors and many "hands in the kitchen." Who is truly involved in the creation of a job? Is it the state agency for workforce development? Is it the inventors who create the company-founding intellectual property? Is it the support efforts of the various agencies (including KTEC), the incubators, the entrepreneurs-in-residence, etc.? It is due to this effect, this "number of cooks at the kettle" that makes it difficult to determine the effectiveness of using such a metric as a measure of the effectiveness of a particular agency.

Thus, the metrics displayed above show Kansas remaining consistently in the lower quartile over the past decade in the categories displayed. The Kauffman data, the Moneytree® report data, and the AUTM data, with occasional year-occurrence "blips" which parallel national shifts, continue to show Kansas in the same performance range for most established metric data. While some data may show upward shifts for one quarter, or for one data point, the overall trend data do not show prolonged growth or extended change in status over an extended period in most categories over a decade of data.

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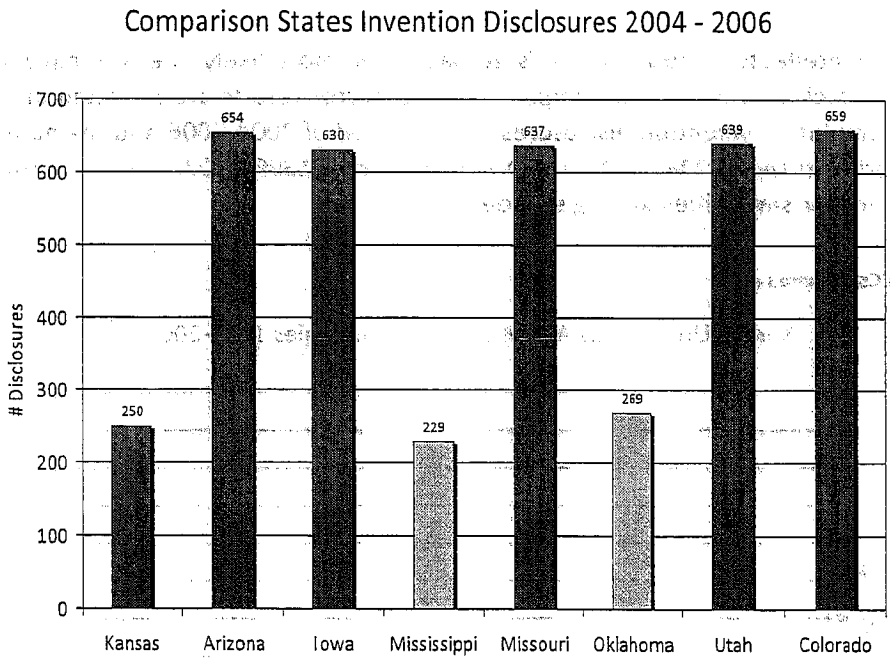
Invention Disclosures

Invention disclosures have been identified as a key measurement of entrepreneurial activity and as an indicator of the commercialization activity of scientists in universities[52]. These "new potential invention" disclosures are an indication of ongoing activity at universities related to research activity that might lead to new inventions. While some invention disclosures are indeed patentable, they may encompass trade secrets, copyrights, or early entry into the market. However, many are not patentable or marketable, and may simply be either discarded or sent back for further development, to be submitted again later.

Regardless, there is strength in numbers. The Association of University Technology Managers (AUTM), a national non-profit association of technology transfer professionals, issues reports on collected statistical data from various programs around the U.S.; one key statistic is the cumulative data on reported invention disclosures. These data are reported by the respective institutions themselves and therefore, the accuracy of the data is dependent on the institutions. The last cumulative report issued was for data collected from 2004-2006. These data are represented in the following graph:

Figure 18: Comparison States Invention Disclosures[53]



The comparison states selected for this graph were based on the report and survey work conducted by RTI, Inc., on KTEC, and on the study conducted by the state audit agency, LPA. The numbers for each State represented in this graph are composites of two (2) universities in each state. For Kansas, the number represents KU and K-State; for Mississippi, it represents the University of Mississippi and Mississippi State, and so forth. The only private institute represented is in Missouri, where the University of Missouri and Washington University in St. Louis are represented. The graph clearly displays the current placement of Kansas in the lower rankings of state composite figures; the cumulative number of invention disclosures for Kansas' two state universities in this survey data over the 2004-2006 survey was 250. This would indicate a lower tendency of commercialization potential in Kansas over the 2004-2006 period and a lower potential for the future, as there would be less Intellectual Property available to commercialize and patent.

[52] Academics or Entrepreneurs? Entrepreneurial Identity and Invention Disclosure Behavior of University Scientists, George, G., Jain, S. and Maltarich, M., Social Science Research Network,

[53] Mississippi and Oklahoma are also EPSCoR states

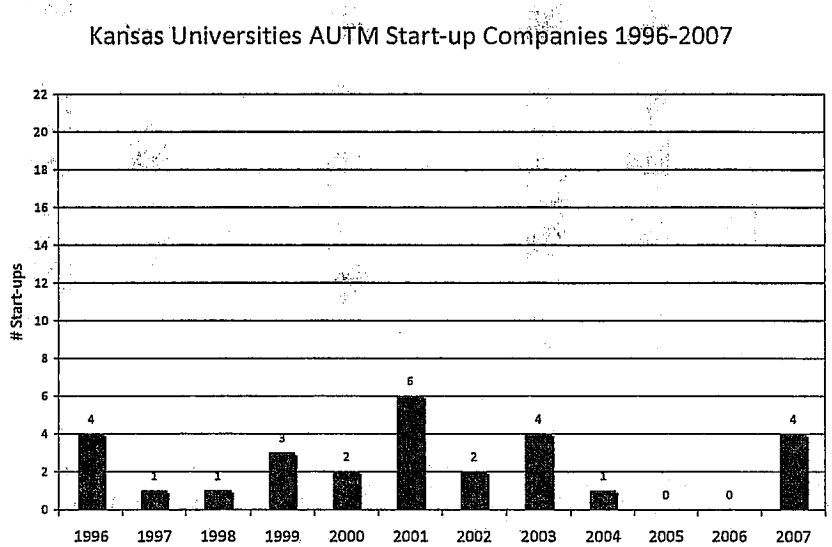
This is a "red flag" for Kansas, and indicates a lack of progress in encouraging or obtaining potential intellectual property out of Universities. It also indicates (if the trend over the 3 years of data is examined), a steady constant base of invention disclosure averages with no real trending increase over the years to show a positive change in the entrepreneurial environment. Thus, these data show little change in Kansas' invention disclosure averages over this time span, and it shows Kansas lagging behind peer states when compared to overall cumulative data.

This is a concern, as KTEC's mission does include "working with Universities to develop Intellectual Property" and to pull new inventions out of the universities, to develop new companies. KTEC sponsors the "Centers of Excellence" at the Universities, which, in theory, should be producing significantly more intellectual property and spinout company opportunities.

Relative to spinout companies, AUTM data, over a period of 11 years, shows another disturbing downward trend. During the period of 2003-2007, 9 start-up companies were formed out of all Kansas Universities combined (KU, K-State, and KU-Med). Note that during 2005/2006, there were no start-ups reported. Relative to the previous data, this intertwines with the amount of available intellectual property – as invention disclosures decrease, the number of opportunities to start companies based on new intellectual property will also decrease.

It follows that the more intellectual property that is available, the more likely one is to have a good "platform" technology base upon which to start a new company. These mirror results are reflected in the accompanying AUTM data for both cumulative invention disclosures in the period of 2004-2006 and the number of companies formed in the same period in the AUTM Start-up company data from 1999-2007, as seen below. The scales have been adjusted to account for similarities among schools.

Figure 19: Kansas Start-up Companies A



How do other states compare? Looking at comparator states for similar data these are the results (Colorado and Utah are forerunners from the comparison set):

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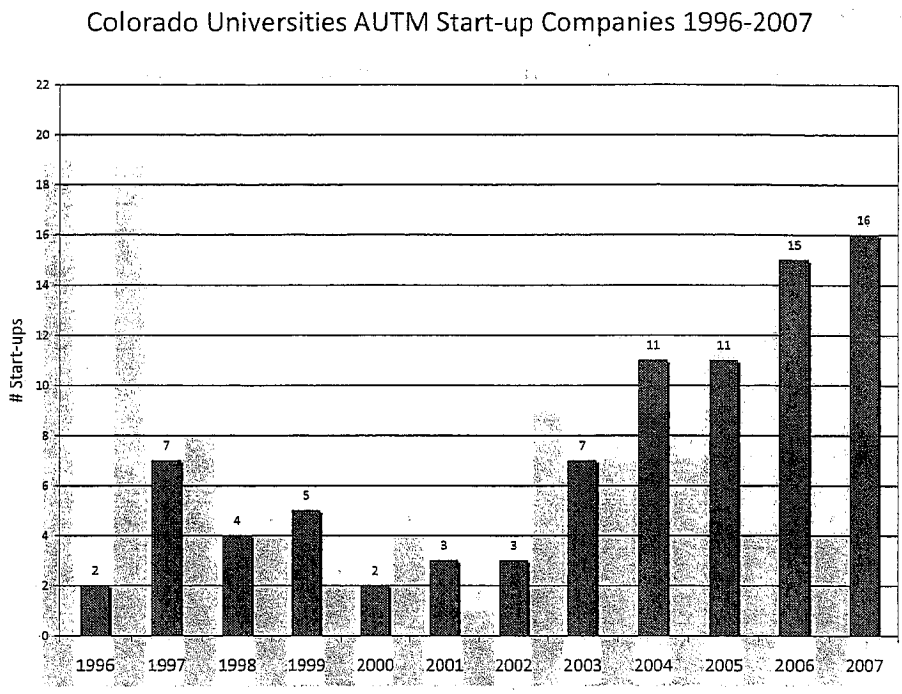
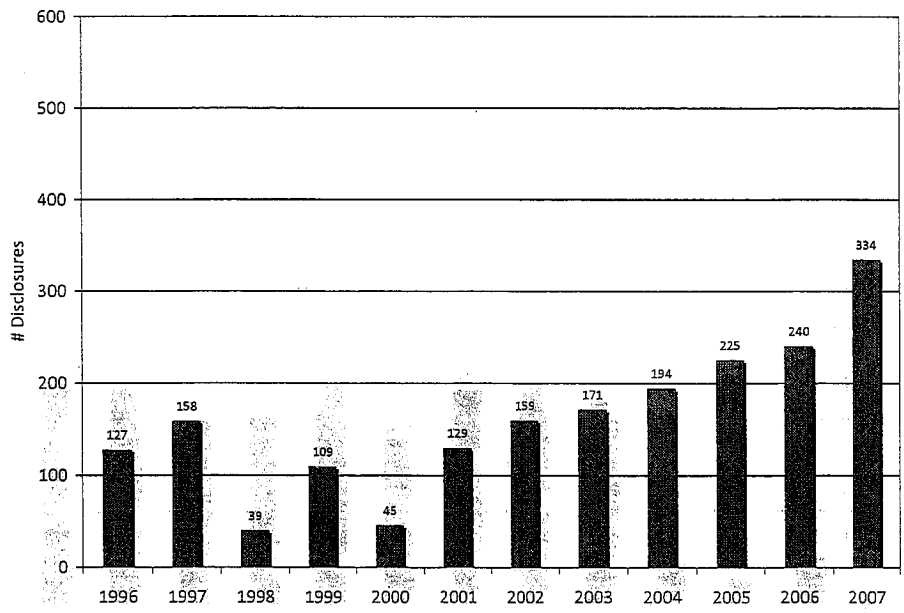
Figure 20: Colorado Start-up Companies



Colorado shows a clear progression in the number of startup companies, particularly in the years from 2003-2007. Comparing invention disclosure data as a comparator, the same trend prevails:

Figure 21: Colorado Invention Disclosures



Colorado provides an excellent picture of a composite example of a rise in invention disclosures accompanied by a rise in new company start-ups; the influx of additional intellectual property provides "more to choose from" in starting up new companies.

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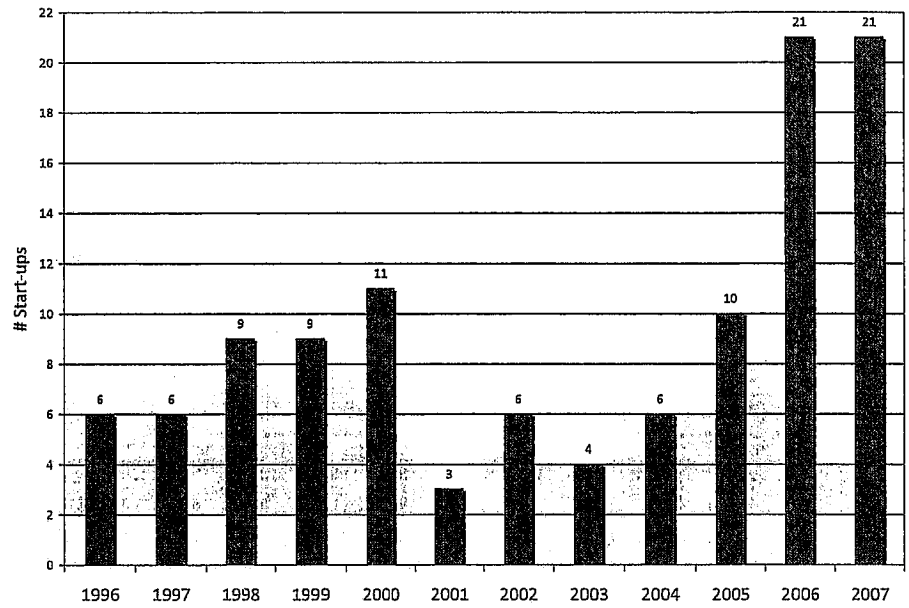
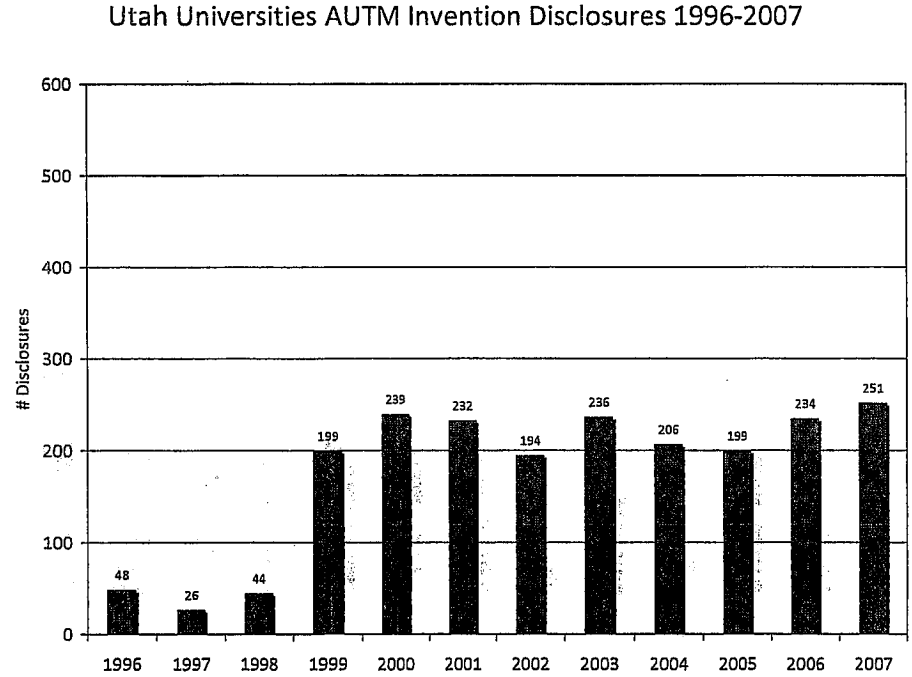
Looking at Utah, another peer state, we see exactly the same trend data:

Figure 22: Utah Start-up Companies



There is an appreciable gain in start-up companies over the period of 2003-2007; once again, below, in Invention Disclosures for Universities in Utah:

Figure 23: Utah Invention Disclosures



While the upward momentum is not as precipitous as Colorado, there is a rise in the amount of available intellectual property to "choose from" to create start-up companies, and there is a substantial amount of intellectual property available.

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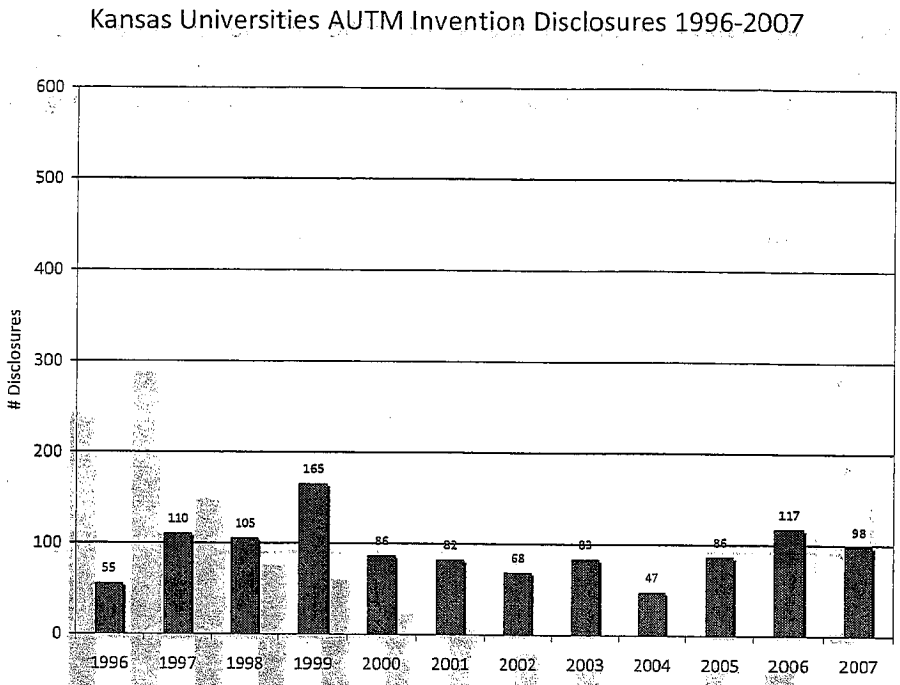
Figure 24: Kansas Invention Disclosures



However, in the Kansas composite graph, while there appears to be a "rise" in intellectual property in the years 2003-2006, first looks can be deceiving. The total amount of disclosures is the key – there are typically less than 100 disclosures reported, with all schools added together (KU, K-State, and KU-Med). This provides a small pool for the selection of intellectual property for starting up companies; thus, the resultant graph (shown earlier in figure 20) which shows a small number of start-up companies (and even a decline in the years 2003-2007).

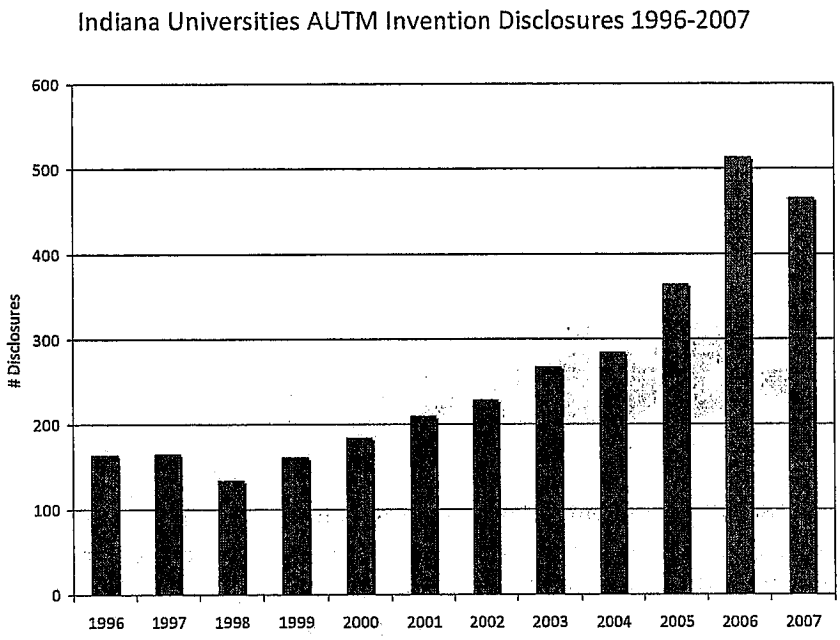
Thus, the overall summary shows a lack of intellectual property being disclosed through the university system in Kansas. There is no strong evidence showing any "effect" of the Centers of Excellence or any other KTEC program, or KTEC itself, on the disclosure or stimulation of research at Kansas Universities. Indeed, in most states, universities are looked upon as a key component of "entrepreneurial churn" , and most researchers have identified financial, human capital, and organizational frameworks as having the key effects on university technology transfer outcomes[54]. Certainly the stimulus role of the outside agency group, plus the catalyst of the internal "center of excellence", should be expected to have an overall positive impact on a University's ability to create and produce both intellectual property and the start-up companies that are created as a result of that intellectual property. As shown in the examples above, that process is underway in many peer states, but does not seem to be occuring in Kansas.

[54] Powers, J. and McDougall, T., University Start-up Formation and Technology Licensing with Firms that Go Public; A Resource-Based View of Academic Entrepreneurship, Journal of Business Venturing, Volume 20, Issue 3, May 2005, Pages 291-311

Midwest Example: Indiana

The State of Indiana is a classic example of the "perfect storm" when all the correct elements to promote TBED come together, with identifiable results. First, relative to the prior discussion of invention disclosure rates, let us examine the invention disclosure history as recorded by the Association of University Managers (AUTM):

Figure 25: Indiana Invention Disclosures



The chart shows an obvious increase, particularly in the years from 2003-2006. This coincides with three other primary occurrences in Indiana during this period:

1. The formation of BioCrossroads, a non-profit organization funded by the Lilly Endowment and the Central Indiana Corporate Partnership. BioCrossroads was formed by the Central Indiana Corporate Partnership, the City of Indianapolis, Indiana University, Purdue University, and the Indiana Health Industry Forum as a joint venture to leverage Indiana's life sciences assets and promote life sciences as an industry of focus for the state;
2. The formation of the Indiana Economic Development Corporation (IEDC) (formed two years later), a public/private agency, formed in place of the former Indiana Department of Commerce, to focus on new business attraction, retention and growth, unencumbered by traditional government methods; and
3. The adoption, by Indiana University, of a new method of technology transfer, encouraging companies to engage earlier in research stages and to be more open to licensing and more creative in starting new companies.

These three factors, and the establishment of a center of excellence for "translational research," led to an increase in start-up companies, an increase in invention disclosures, and an increase in patents filed and granted. This combination provided a marked increase in economic development activity in Indiana as measured by all metrics by the IEDC over the particular period of 2003-2007, as will be shown in later graphs and data.

This convergence of events, in Indiana, gives a very dramatic picture of what can be achieved in economic development when forces combine for the same cause. The primary efforts of the Indiana Economic Development Corporation were directed toward business attraction, business retention, and new business

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formation. The IEDC also focused efforts on working with Universities to develop relationships for licensing IP, for sponsoring research, and for starting new companies out of University IP.

BioCrossroads, a non-profit organization dedicated to Life Sciences (somewhat similar to the Kansas Bioscience Authority), works with universities, the IEDC, local economic development groups, and other groups to attract, retain, develop and start life sciences companies. In particular, BioCrossroads developed start-up funding and other investment funding to finance start-ups. BioCrossroads provided management advice, direction, and general advisement to assist start-up companies.

BioCrossroads also focused on translational research, moving early-stage research out of Universities by providing additional research funding to "mature" the research into marketable/patentable technology that was moved to a start-up company as the basis for that company's formation. BioCrossroads hired a full-time staff person to work in the university medical school, looking at research grants and ongoing research work that might be amenable to translational opportunity funding to be turned into marketable intellectual property. BioCrossroads, therefore, provided funding, advisement, translational research mining and start-up assistance.

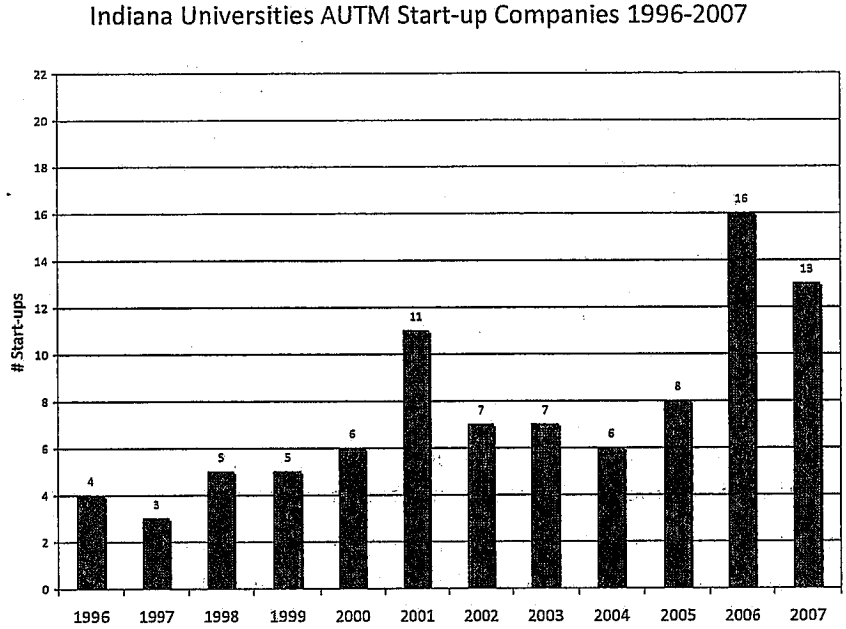
The emergence of BioCrossroads indicated an intentional effort to focus on specific and quantifiable emerging life science technologies in Indiana, to assemble the resources necessary to compete in this field, and to create a pipeline that begins inside the universities and extends into the marketplace.

At roughly the same time, Indiana University "re-engineered" its technology transfer program. The university hired new personnel, began an "outreach to faculty" program, and initiated a series of regular training and education seminars to help faculty understand the importance of the disclosure of intellectual property, valuation, and the intricacies of creating a new company. The outreach and education efforts combined with a departmentalized focus of assigning particular individuals to departments to develop relationships with faculty, so a "trust" relationship. Over time, this assured that more information would be forthcoming concerning the research of the faculty member, and resulted in a gradual increase in invention disclosure rates.

As a larger number of technology transfer employees were hired (an increase of 25 percent in the department – from 7 employees to 10) to provide more coverage for the entire faculty. More faculty members could then be carefully studied as to the patentability and marketability of their respective (or prospective) intellectual property. In addition, in 2003, IU founded and started operating the Indiana University Emerging Technologies Center (IUETC), a biosciences incubator in downtown Indianapolis to house new life sciences start-up businesses founded out of University technologies. The University saw a need for such a facility as a result of the early stages of increased technology transfer activities.

What of the data? The respective individual datasets are represented in Figures 25 and 26.

Figure 26: Indiana Start-up Companies



As can be seen from the graphs above, there is a clear upward trend that appears over the years 2003-2007 in invention disclosures, start-up companies, and job creation commitments. The combined efforts of all parties – the financing, the advisement, the data mining, the education, the commercialization efforts – all worked together in a way that provided direct results that shows up as indicated above. These results are all key (as previously discussed, in the comparison of state results) in TBED – and these results have been generated by the efforts of the University technology transfer department, the efforts of BioCrossroads, and the efforts of the Indiana Economic Development Corporation. This is an excellent example in TBED efforts working together at their best, to provide measurable results in a real-time environment.

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Section VIII - Conclusions

Conclusions and Recommendations

Conclusions

TPMA has attempted to highlight in its conclusions key topics for discussion, rather than make policy recommendations. When asked, many interviewees stated, "KTEC's programs are good for the State of Kansas." When asked for further elaboration, however, few could effectively describe such programs, or effectively and completely describe a mission for KTEC other than "driving the technology economy growth of Kansas." Other interviewees stated exactly the opposite, that KTEC was not fulfilling some of the above identical roles. This study is an attempt to reconcile these differences by observing and reporting on what is working and what is not. TPMA's conclusions fall along several key dimensions:

- Kansas needs a focal point for entrepreneurs and innovators.
  - Many individuals that were interviewed for this project cannot imagine Kansas having an entrepreneurial presence without KTEC. They indicated that KTEC is the hub of the entrepreneurial network in the state.
  - KTEC has been successful in enhancing entrepreneurial business climate in Kansas but could do more to establish networking opportunities among entrepreneurs and technologists, by actively promoting Kansas' assets to venture capitalists, and by actively creating multiple 'front doors' where entrepreneurs can easily access support
  - While KTEC has served as a catalyst for inter-university collaboration, it could be more actively engaged in convening multiple universities to facilitate cross-technology innovation and to facilitate actively commercialization of university research by sponsoring and facilitating seminars that bring together researchers from universities that have complimentary technologies or that highlight multiple research projects within specific technologies.
- KTEC needs a clear vision of its role in building a successful Kansas economy.
  - The KTEC model as originally envisioned is solid. The current execution of the model, however, could be updated and evolved to a clearer focus on specific technologies where Kansas has the opportunity to excel.
  - The qualitative difference that KTEC has made by building capacity for shared intellectual discovery and business assistance is difficult to measure. It's where the real impact is being made.
  - KTEC may be guilty of compulsively branding itself. KTEC should not unnecessarily promote itself but promote the Kansas entrepreneurial climate and legitimate successes.
  - KTEC does not have an operational definition of 'technology-based economic development' to guide its investment decisions and programs.
  - The board of directors may be less engaged than is envisioned in the enabling statutes.
  - KTEC's portfolio could be more focused. 'Technology' is too broad a focus for KTEC, the Kansas Bioscience Authority has been created by KTEC to concentrate on bioscience technology, and other technology platforms may be falling through the cracks due to insufficient attention. KTEC should look for concentrations of emerging technology and focus on areas where Kansas can develop a leadership role.

Recommendations

- During these difficult economic times when states are struggling to make ends meet, economic development activities are a popular cost-cutting target. In the case of KTEC, rolling its function into another organization or eliminating the function altogether would force Kansas to relinquish its place in the 'technology race' and risk falling further behind. Failure to support the specialized talent required to advance technology-based economic development and failure to provide adequate resources will consign Kansas to the back of the technology pack for many years to come.
- KTEC should continue to identify unique technology clusters in Kansas around which the innovation economy can be built. Some interviewees identified animal health, embedded systems, and plastics as potential opportunities.
- KTEC needs to establish a clear and uniform set of metrics, collect and maintain information that supports these metrics, and regularly report progress. Metrics should reflect outcomes rather than activities.
- KTEC could better serve its stakeholders and foster a more entrepreneurial culture in Kansas by posting all annual reports, schedules, minutes, etc. online, as would providing more materials to board members in advance of meetings.
- KTEC needs mechanisms in place to assure that the Board of Directors is fulfilling its fiduciary role and is operating in accordance to statute. Encourage Board members and their delegates (e.g., members of the Board Investment Committee) to take a more active role in decision-making. For example, investment recommendations should be presented by an Investment Committee member, rather than by KTEC staff. The committee is responsible for making the recommendation; KTEC staff is responsible for managing the process and providing information and analytical support as requested by the Board.
- Provide thorough and adequate information to the Board well in advance of board meetings to enable them to make appropriately informed decisions. Board members must be informed to be able to fulfill their statutory duties.
- Maintain the integrity of the Board nomination and selection process.
- Build Board capacity to ensure that entrepreneurs, technology experts, intellectual property attorneys, and financial experts are represented on the board. Structure the board with at least one entrepreneur who never has (and probably never will) go to KTEC for funding. Implement a rotation system for the Investment Committee so that expertise is developed and concerns about closed group decision-making are allayed. Consider downsizing the board and create a Governor's Technology Roundtable that meets the political needs for balance.
- A determination should be made about how to address underperforming centers of excellence. KTEC should properly consider whether to continue funding an underperforming center, redesign the center to make it more multi-disciplinary or relevant to attract federal funding, or consider withdrawing funding altogether. The latter option should not be construed as "punishment." Withdrawn funds would be redistributed, perhaps to start a new center in a technology area that has more traction.
- Work with existing companies to identify "orphan" technologies and identify employee mentors/interns/students that could develop them to the proof-of-concept stage.
- Leverage existing entrepreneurship programs and consider extending the Pipeline brand to meet needs of entrepreneurs at different stages of development.

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KANSAS TECHNOLOGY
ENTERPRISE CORPORATION

April 13, 2009

Mr. Stan Ahlerich, President
Kansas, Inc.
632 SW Van Buren, Suite 100
Topeka, KS 66603

Dear Mr. Ahlerich,

Thank you for the opportunity to respond to the assessment conducted by Thomas P. Miller and Associates (TPMA). KTEC takes very seriously any assessment of its programs, impact and mission. We recognize that TPMA, in its capacity as a consulting group charged by Kansas, Inc., has worked to fully understand and assess our programs-- as has occurred in other voluntary and outside assessments KTEC has undergone over the past few years. As TPMA notes, the role of KTEC in technology based economic development is an important one, and it is always valuable to hear perspectives on how we might have an even greater impact than we previously have had in Kansas.

Kansans can be reassured that the TPMA assessment supports KTEC remaining intact, separate from other agencies and fully functioning. The assessment validates the mission and accomplishments, and at the same time makes a series of actionable recommendations. We will fully explore the recommendations and address areas where we can improve.

Among the important recommendations is that KTEC not be dismantled or folded into other agencies. We appreciate recognition of the many positives in the report and also value constructive comments that indicate need for continued improvement. We already have steps in place to address matters that evolved as the organization has, and the Board of Directors and management team pledge to continue to work diligently to deliver quality programs as we strive to produce maximum benefits for the state.

In a few critical areas of the report, factual errors or misconceptions substantially affect certain recommendations. It is important to stakeholders that any actions KTEC takes toward improvement are based on a complete understanding of issues. Therefore, we offer clarification on factual errors and misconceptions, that if corrected would significantly affect the final recommendations of the report.

TMPA notes in its first recommendation:

1. *During these difficult economic times when states are struggling to make ends meet, economic development activities are a popular cost-cutting target. In the case of KTEC, rolling its function into another organization or eliminating the function altogether would force Kansas to relinquish its place in the 'technology race' and risk falling further behind. Failure to support the specialized talent required to advance technology-based economic development and failure to provide adequate resources will consign Kansas to the back of the technology pack for many years to come.*

Further recommendations:

2. *KTEC should continue to identify unique technology clusters in Kansas around which the innovation economy can be built. Some interviewees identified animal health, embedded systems, and plastics as potential opportunities.*

KTEC Response:

KTEC will continue to refine targeted cluster activities in materials, aviation, pharmaceuticals, information technology, and manufacturing modernization. Through The Centers of Excellence and new initiatives (such as KEGA and Cleantech), KTEC works diligently to focus its innovation efforts in key areas where Kansas has a nucleus of resources and an opportunity for growth.

The targeted Centers of Excellence are:

- Advanced Manufacturing Institute at Kansas State University focuses on product design and engineering, automation, and manufacturing process development, and technology development and commercialization.
- Biotechnology Innovation & Optimization Center at the University of Kansas provides a centralized focus for moving technologies into the private sector from pharmaceutical and biomedical research on both the Lawrence and Medical Center campuses.
- Information & Telecommunication Technology Center at the University of Kansas is focused on the areas of computing, communications, and sensors.
- Kansas Polymer Research Center at Pittsburg State University focuses on design, testing, and development of products and processes with respect to polymers and plastics.
- National Institute or Aviation Research at The Wichita State University serves the aviation industry in Kansas by providing research, training, product development, and testing facilities.

Additionally, KTEC's most recent targeted initiative supports growth in the "Cleantech" field. The Cleantech Industry Initiative positions Kansas for leadership in an industry that represents one of the fastest growing opportunities for job and wealth creation.

3. *KTEC needs to establish a clear and uniform set of metrics, collect and maintain information that supports these metrics, and regularly report progress. Metrics should reflect outcomes rather than activities.*

KTEC Response:

- It is unclear why there is a recommendation regarding metrics, as TPMA neither interviewed staff about, nor examined documentation of our measurement processes, and the conclusion is in direct contradiction of the facts. KTEC gathers a well-defined set of verifiable annual economic impact data, which we publish in our annual report. New software allows for integration of data collected for various programs.

- Companies receiving KTEC support are surveyed annually. This information is summarized by staff and is used along with quarterly reports and client meetings to

track client progress and customize services. Indicators are new jobs, saved jobs, payroll, revenues, and capital infusion.

- Angel Tax Credit Companies are surveyed annually. Information is summarized and shared with the Governor, Legislature and KTEC Board. The companies are surveyed on new jobs, saved jobs, payroll, revenues, and capital infusion.
- Manufacturing program clients are surveyed one year after project completion, in accordance with a process set by the federal co-sponsor of the program. Metrics include cost saving in production, investment in plant, equipment and information systems, investment in workforce training, new sales, retained sales, new jobs created, and retained jobs.
- Performance metrics are also collected on Center of Excellence, Business Assistance Incubators, and EPSCoR/Star Fund recipients. KTEC PIPELINE recently developed metrics which are being implemented for the current fiscal year.

4. *KTEC could better serve its stakeholders and foster a more entrepreneurial culture in Kansas by posting all annual reports, schedules, minutes, etc. online, as would providing more materials to board members in advance of meetings.*

KTEC Response:

KTEC plans to make the changes recommended regarding the board meeting dates and minutes. Recent annual reports and the investment committee schedule are currently posted on the KTEC website.

5. *KTEC needs mechanisms in place to assure that the Board of Directors is fulfilling its fiduciary role and is operating in accordance to statute. Encourage Board members and their delegates (e.g., members of the Board Investment Committee) to take a more active role in decision-making. For example, investment recommendations should be presented by an Investment Committee member, rather than by KTEC staff. The committee is responsible for making the recommendation; KTEC staff is responsible for managing the process and providing information and analytical support as requested by the Board.*

KTEC Response:

- KTEC Board and Executive team will take steps to more actively engage Board members in involvement with the organization, introducing Strategic Planning sessions and issuing invitations to board members to participate in Investment Committee activities.
- A number of Board members are actively engaged in the direction, policy, function and operations of KTEC. The Board functions openly and with transparency.
- In recent Board meetings, outside legal counsel has made presentations to the Board on board duties, Conflict of Interest policy, and fiduciary responsibilities.
- An Investment Committee is in place, in accordance with the statutes. It includes three board members, who have the specialized expertise to provide appropriate diligence on proposed investment opportunities. Board members who require detailed information are encouraged to ask questions. All board members are invited to join the Investment Committee.

6. *Provide thorough and adequate information to the Board well in advance of board meetings to enable them to be appropriately informed. Board members must be informed to be able to fulfill their statutory duties.*

KTEC Response:

KTEC staff will continue a dialog with the Board to determine what additional materials they would like to be provided in advance. As requested by the board, materials including agenda and financials are provided a few days prior to each board meeting.

7. *Maintain the integrity of the Board nomination and selection process.*

KTEC Response:

No problems related to the nomination and selection process were cited in the report.

8. *Build Board capacity to ensure that entrepreneurs, technology experts, intellectual property attorneys, and financial experts are represented on the board. Structure the board with at least one entrepreneur who never has (and probably never will) go to KTEC for funding. Implement a rotation system for the Investment Committee so that expertise is developed and concerns about closed group decision-making are allayed. Consider downsizing the board and create a Governor's Technology Roundtable that meets the political needs for balance.*

KTEC Response:

KTEC has considered downsizing the investment committee periodically in the past and has invited board members to serve on the committee to provide a rotating panel of expertise. We will continue to seek ways for rotating participation.

The Board is comprised of members with the expertise specified by statute. TPMA's recommendation on board composition does not recognize the considerable private sector talent within the existing board. For example:

- Entrepreneur: Tom Lauerman co-founded GeoAccess in 1991. He and his business partner grew the software company to more than 300 employees. In 1999, Lauerman was named an Ernst & Young Entrepreneur of the Year, was recent President of the Kansas City-based Entrepreneurial Exchange and is the 2009 recipient of Pipeline's "Entrepreneual Leadership Award". He is currently an investor in, and serves as board member and board advisor to many private companies. Tom has been on the KTEC board since 2006.
- Intellectual Property Attorney: Kyle Elliott is a licensed patent attorney and certified mediator. Since graduating from the University of Kansas School of Law in 1992, Kyle has devoted his career exclusively to intellectual property law. Kyle has been on the KTEC board since 2006 and the KTEC Investment Committee since 2002.
- Financial Expert: Ted Haggart is President and CEO of Douglas County Bank. Before joining DCB, Ted was President of Union National/Commerce Bank in Manhattan and Senior Vice President of First National Bank in Salina. He also was an economics professor at Kansas State University, executive director of the Kansas Economic Education Council and an economist for the U.S. Senate Budget Committee. Ted has been on the KTEC board since 2001 and has chaired business incubator boards in both Manhattan and Lawrence.

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9. *Work with existing companies to identify "orphan" technologies and identify employee mentors/interns/students that could develop them to the proof-of-concept stage.*

KTEC Response:

KTEC's Proof of Concept (POC) program has been in existence for two years. KTEC has funded projects at WSU, KSU and KU totaling over $100,000.

10. *Leverage existing entrepreneurship programs and consider extending the Pipeline brand to meet needs of entrepreneurs at different stages of development.*

KTEC Response:

We will continue to evaluate services directed to the entrepreneur. The report recognizes the fact that the KTEC PIPELINE has garnered significant praise and support of national thought leaders. The program supports entrepreneurs in several stages of development and has extended its offerings "upstream" through creation of primer programs available to any Kansas entrepreneur and to high school students through collaboration with the Youth Entrepreneurs of Kansas.

Closing Comments:

While we believe it is important to provide clarifications and corrections on some of the key issues, we appreciate the recognition of the many positives noted in the report, as well as the recommendation to keep the organization separate from other agencies. We value suggestions for improvement that will assist us in providing maximum results for the state.

Kansas' participation in the innovation economy is increasing. This is evident by various measures collected at the national level, the fact that the national conference of state technology-based economic development organizations is coming to Kansas this fall and most importantly, the growing successes of technology-based companies in our state. KTEC looks forward to continuing to evolve and helping to solidify Kansas' position in the innovation-based economy.

Sincerely,

Tracy B. Taylor
President & CEO

Kansas, Inc.

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(785) 296-1463 (fax)
www.kansasinc.org
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Special Legislative Committee on KTEC
October 7, 2009

KTEC OVERVIEW
Kyle Elliott, Chairman, Kansas Technology Enterprise Corporation

My name is Kyle Elliott and I am presently a patent attorney with Spencer Fane Britt and Brown in Kansas City. I have been serving KTEC since 2004 and was recently elected chairman of the board in June.

A majority of what you'll hear throughout the next two days revolves around the importance of technology-based economic development (TBED), specifically what Kansas is doing in this field, and how Kansas can maximize its efforts.

Our economy has been transformed over the past few decades:

- It is well documented that the economy is being driven by technology
- Competition is global
- To be competitive, Kansas needs a foundation of companies that create new ideas and adapt technology to the marketplace
- The capacity to innovate is critical
- Innovation involves not only robust technology, but a culture of moving technology into a successful company.
- Innovative companies are "wealth creating" as opposed to "wealth circulating" – generating new revenue from outside the region, essentially becoming the economic engine

The elements required for an innovation-based economy are:

- Sources of technology – turning technology into new, marketable products
- Mechanisms to transfer technology from the university to a company and eventually sold company-to-company
- Early stage investment capital
- Entrepreneurial culture
- Skilled work force to support growth

KTEC encourages development of innovative companies through an integrated set of technical, financial and business development tools, which Kevin Carr will discuss with you.

- TBED is more about wealth creation that subsequently leads to job creation.
- KTEC programs do not create jobs – it's the companies that do.
- KTEC focuses on starting and growing highly competitive, fast growth companies.

Special Interim Committee on KTEC
Date: October 7, 1009
Attachment 3

- KTEC provides a hands-on approach that requires a close relationship to entrepreneurs and the investment community.
- The quality of each entrepreneurial effort is critical in light of global competition and the current economy.

During the 2009 Legislative session, you may have heard a number of things about our organization. All along though, I believe we have produced positive results for Kansas.

We did have some issues to deal with, and our Board addressed those needed changes. Moreover, the Board is highly engaged – in fact, since the June board meeting, we now have board members actively involved in all committees, and have a promising strategy underway.

During these next two days we will provide you an opportunity to hear about our proactive measures and will invite your input to help KTEC move forward. I truly believe KTEC will continue to do a good job of what it was created to do.

I appreciate the opportunity to be here today and hope that you'll go away with a better understanding of what KTEC is doing for Kansas and what we anticipate moving forward. It is our hope to keep an open line of communication with the Legislature.

Our goals are to restore KTEC as a model among state-based technology organizations, and, most importantly, maximize our impact on Kansas. We have already taken significant strides toward these goals, and I am confident we will reach them.

I am happy to answer any questions you may have.

KTEC

Special Interim Committee on KTEC
Date: October 7, 2009
Attachment 4

Special Committee on KTEC

Legislative Interim Session

October 7, 2009

Morning session

KTEC

4-2

Agenda

October 7, 2009

High-Tech Entrepreneurism

KTEC Impacts

Programs

Collaboration with other Agencies

KTEC

4-3

Need for Technology Entrepreneurism

- Emerging entrepreneurial growth companies are responsible for 67% of new jobs (more in economic downturns) and 95% of all radical innovations since WWII .
- Jobs created by tech companies pay two times the average salary of non-technology jobs.
- Reduces brain drain
- Diversifies tax base
- A region's economic prosperity is closely tied to its entrepreneurial capacity .
- Entrepreneurial companies seek talent, capital, networks and infrastructure.

** Based on the National Commission on Entrepreneurship, 2001*

KTEC

4-4

Impact On Kansas

- Cyberstates 2009," ranks Kansas #1 in the nation for high-tech industry job growth.
- The 2008 State New Economy Index ranks Kansas 8th in Nation for "Gazelle Jobs."
  - Rapid growth "Gazelle" companies account for 80% of new jobs created.
- PricewaterhouseCoopers and the National Venture Capital Association ranks Kansas 13th in venture capital investments for the number of investments made.

KTEC

4-5

Metrics Process

For more than 15 years, KTEC has surveyed companies on the following metrics for a minimum of five years following assistance. Results are published in the annual report , shared with the KTEC Board of Directors, and posted on the web site. Affiliate results are sent to the KTEC Network in September of each year.

	Grant Programs	Centers of Excellence	Entrepreneurial Centers	KTEC Investments	Angel Tax Credits	Pipeline	MAMTC
New Jobs							
Saved Jobs							
Payroll							
Revenue							
Capital Infusion							
Companies Assisted							
Federal Leverage							
Industry Leverage							
Cost Savings in Production							
Costs Avoided							
Investment in Work Force Training							
Plant & Equip Investment							
New Sales							
Retained Sales							
Number of Proposals							
Number of Participating Students							

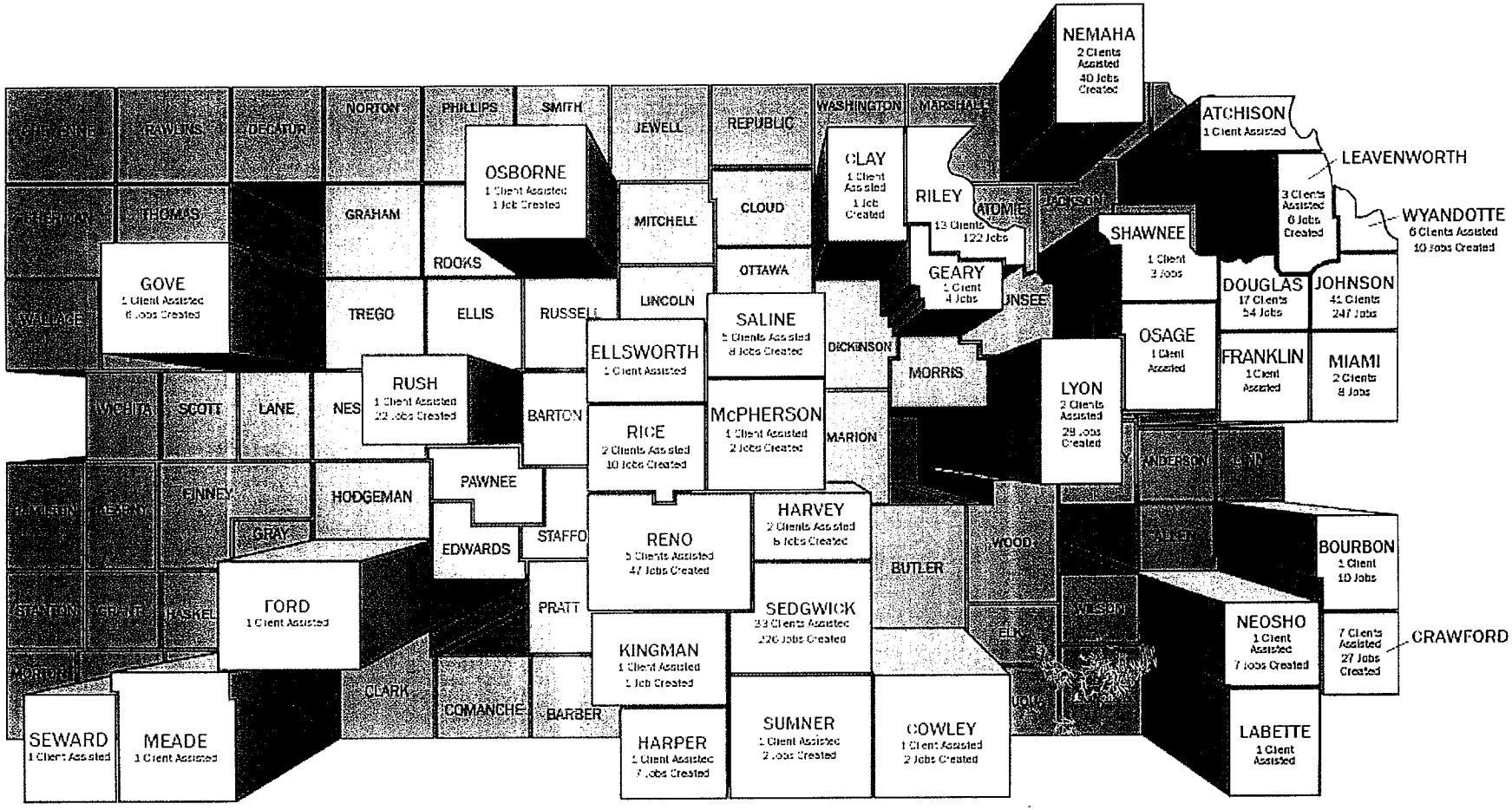
KTEC

4-6

KANSAS TECHNOLOGY ENTERPRISE CORPORATION ECONOMIC IMPACT FOR FY 2006 THROUGH FY 2009

Commercialization	FY 2006	FY 2007	FY 2008	FY 2009	Total
New Jobs	294	420	504	501	**1,719**
Saved Jobs	258	366	429	408	**1,461**
Start-up Companies	15	17	20	8	**60**
Sales Revenues (in 000)	152,736	197,877	207,260	315,681	**$873,554**
Private $ Leveraged (in 000)	50,797	43,366	46,169	56,947	**$197,279**
Federal $ Leveraged (in 000)	85,731	63,799	93,903	124,750	**$368,183**
Return On Investment (ROI):					
KTEC ($ to 1)	0.73	0.96	1.00	1.57	**1.06**
Private $ Invested in KS vs KTEC ($ to1)	31.34	23.12	46.85	126.54	**42.00**
Federal $ Invested in KS vs KTEC ($ to 1)	12.28	8.22	14.19	21.99	**13.84**
Companies Assisted	168	258	209	161	**796**
Counties Impacted	38	47	39	35	

KTEC Benefits Kansas



161 companies assisted in FY 2009

KTEC

4-8

Vision, Mission & Strategy

VISION

Kansas will become a leading location for high-growth potential companies to flourish, with a dynamic entrepreneurial environment and higher-paying jobs resulting from translating technology into a positive Kansas economic impact.

MISSION

To generate high-tech growth for Kansas through the translation of science, technology, and business know-how into highly competitive businesses with emphasis on creating specialized industry clusters.

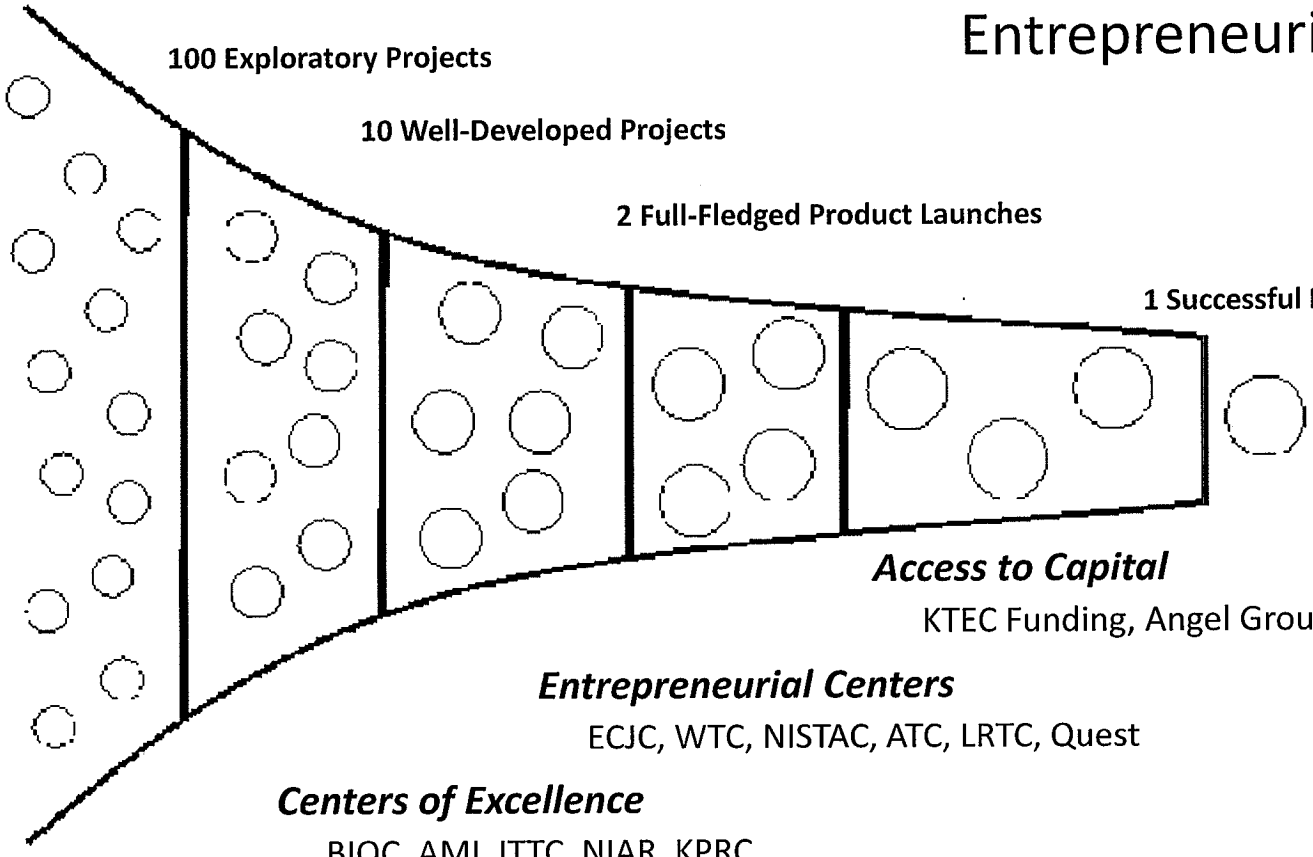
FOR THE PURPOSE OF:

- Creating higher paying jobs.
- Increasing revenues into the economy.
- Diversifying the tax base.
- Reducing the state's brain drain.
- Providing capital investment in the non-biosciences.

KTEC

H-9

Entrepreneurial Environment



Access to Capital

KTEC Funding, Angel Groups, Angel Tax Credits

Entrepreneurial Centers

ECJC, WTC, NISTAC, ATC, LRTC, Quest

Centers of Excellence

BIOC, AMI, ITTC, NIAR, KPRC

Access to Grants

EPSCoR, STAR, Proof of Concept

Entrepreneurial Education - PIPELINE

Manufacturers Positioned for Growth - MAMTC

Source: "Commercialization Success Rates: A Brief Overview," RTI Tech Ventures, Dec. 2007

KTEC

4-10

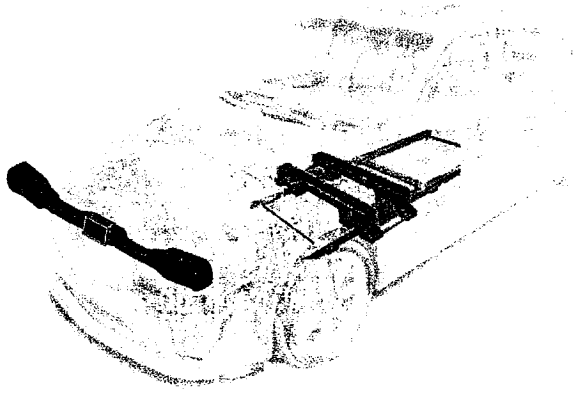
Measuring Wand for Automotive Body Repair – Salina, KS

CEO – Jan Srack

Patented wand measures auto bodies needing repair.

The wand is wireless, handheld designed to capture & document 3D images of collision damaged vehicles.

Matrix software compares the image with factory specs to determine repair estimates & specifications (within 2mm).



KTEC Involvement

Pipeline class of 08

Wichita Entrepreneurial Center involved since late 07

KTEC Tax Credits – $600K over 2 years

KTEC Investment - $100K in 2008

Results:

Total capital raised to date - $4.2MM

Revenue - $200K in 2009 to $3.8MM in 2011

Jobs – 4 in 2009 to 8 in 2010

FINANCIAL PROJECTIONS

Units Sold		18	89	256
Sales	**2008**	**2009**	**2010**	**2011**
Wand Gross Revenue	-	270,000	1,335,000	3,840,000
Software Gross Revenue	-	-	19,800	117,700
Total Revenue	**-**	**270,000**	**1,354,800**	**3,957,700**

CritiTech

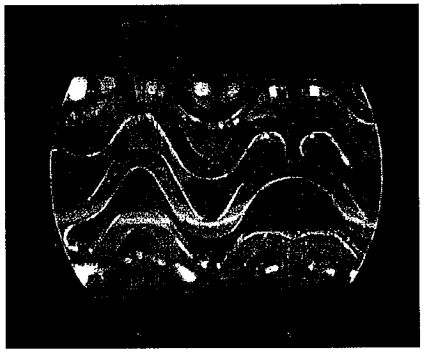
KTEC

4-11

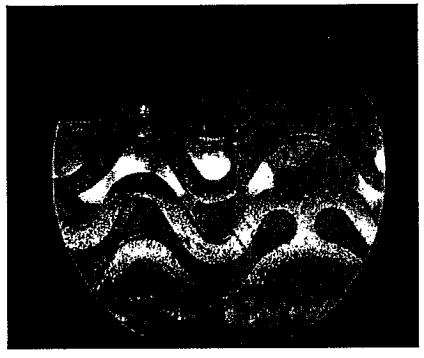
Nanoparticles of drug compounds, biologicals, and polymers – Lawrence, KS

KTEC Involvement

Drug development – KU – BIOC
Lawrence Entrepreneurial Center involved since 2001
Angel Investments – Wichita & Mid America
Angel Tax Credits - $900K 2005-2008
Investment - $400K 2001-2006



Stent prior to coating



Stent after coating

Business model

To create nanoparticles of drug compounds, biologicals, and polymers for:

- Drug delivery (oral, inhalation, injectables)
- Device coating (stents, time release, taste masking)
- Drug development (oncology, diabetes)

Results:

Ovarian cancer drug in human trials since fall 08
Renal cancer drug pre IND – clinical trials Q4 2010
Total capital raised to date $6.3MM
Revenue - $500K in 2007 to $2MM in 2009
Jobs – 4 in 2005 to 13 in 2009

KTEC

4-12

Grant Programs

EPSCoR/STAR - The Experimental Program to Stimulate Competitive Research (EPSCoR) is a federal program aimed at improving the competitiveness of academic research in states that have not historically fared well in attracting federal research funds. Through EPSCoR, small state grants leverage much larger federal grants for advanced research at Ph.D.-granting Regents universities. Kansas is eligible to compete in the following EPSCoR competitions, all of which require matches from the state:

- Department of Defense (DOD)
- Department of Energy (DOE)
- Environmental Protection Agency (EPA)
- National Aeronautics Space Administration (NASA)
- National Science Foundation (NSF)

The STAR Fund (Strategic Technology Research) is an extension of EPSCoR. The fund is used to support projects which may not receive federal EPSCoR funding per se, but have potential to attract significant other federal or industry leverage and create commercial spin-offs in the state.

	EPSCoR & SBIR		
	2007	**2008**	**2009**
New Jobs	25	27	15
Jobs Saved/Retained			
Total Jobs	25	27	15
Federal $ Leveraged	$31,323,331	$25,370,121	$19,328,196
Industry $ Leveraged	$1,816,058	$1,595,772	$1,824,511

Centers of Excellence

The Centers of Excellence are university-based research centers with an economic development component at the heart of their mission. Each has its own technology specialization. The Centers conduct innovative research and provide technical assistance with the overlapping aims of creating new companies, strengthening existing companies, and serving as an expert resource to other KTEC programs and the state. Centers are focused on the discovery stages of innovation and producing leading edge technologies and also function as product designers and developers for small companies. They serve the state as a driver of innovation as well as a source for highly skilled employees. The Centers provide the following services to client companies: basic and applied research, product and process development, technical consulting, training, seminars, and networking.

2007-2008-2009 Centers	Funding	New Jobs	Jobs Saved	Total Jobs	Total Revenues	Capital from Angels & VC's
1 Advanced Manufacturing Institute	$1,896,338	383	104	487	$262,276,158	$8,521,580
2 Biotechnology Innovation & Optimization Center	$2,145,178	12	29	41	$1,574,206	$13,530,731
Higuchi Bioscience Center	$1,087,000	13	30	43	$1,062,434	$14,663,311
3 Information & Telecommunication Technology Center	$1,713,854	36	12	48	$12,204,326	$2,270,000
4 Kansas Polymer Research Center	$930,762	5	5	10	$6,881,487	$600,223
5 National Institute for Aviation Research	$1,399,499	33	15	48	$8,378,400	$662,723
	$9,172,631	482	195	677	$292,377,011	$40,248,568

KTEC

Entrepreneurial Centers

The program is comprised of an established network of Entrepreneurial Centers focused on high-tech start-ups throughout the state. Such start-ups come not only from the entrepreneurial community at large, but also from businesses formed around patents from technology created by the state universities.

The entrepreneurial network provides a continuum of services that include:

- Corporate organization
- Recruitment of management team
- Market analysis
- Stock offerings
- Revenue and business modeling
- Capital formation including "road show" presentations to investors
- Shared tenant services
- Direct seed capital investment
- Marketing strategy formulation
- Sales organization establishment

2007-2008-2009

Entrepreneurial Centers	Funding	New Jobs	Jobs Saved	Total Jobs	Total Revenues	Capital from Angels & VC's
Alliance for Technology Commercialization	$174,000	10	32	42	$18,014,844	$3,553,500
Enterprise Center of Johnson County	$900,000	126	62	188	$48,940,024	$28,125,962
Lawrence Regional Technology Center	$924,000	103	163	266	$56,359,044	$78,530,717
National Institute for Strategic Technology Acquisition & Commercialization	$900,000	38	19	57	$23,032,904	$2,750,500
Quest Business Center	$105,000	12	1	13	$5,422,427	$0
Wichita Technology Corporation	$945,000	117	115	232	$81,205,335	$23,889,159
	$3,948,000	406	392	798	$232,974,578	$136,849,838

KTEC

4-15

KTEC PIPELINE

KTEC PIPELINE focuses on entrepreneur development - creating leaders who can build and scale businesses and drive economic growth for years to come. The program is unique as it focuses on the business opportunity along with the entrepreneur. PIPELINE is designed to identify high potential technology entrepreneurs, match them with the best available training, resources and mentors and facilitate their dynamic growth in Kansas.

PIPELINE fellowship participants are provided with an intensive training program in how to grow entrepreneurial ventures. They are also linked with mentors and business coaches based in both Kansas and across the U.S. In addition to the focus on the "class" of innovators, the program works with alums, mentors and youth throughout the state on an ongoing basis and provides two-day training courses that benefit significant numbers of Kansans.

	2009
New Jobs	79
Jobs Saved/Retained	82
Total Jobs	161
Total Revenues	$26,402,374
Capital from Angels & VC	$2,945,000
Federal $ Leveraged	$500,000

PIPELINE's first year of operation was 2007 – 2009 is the first fiscal year for surveys

KTEC

4-16

Access To Capital

Investments

The Investment Program provides funds to new and existing small Kansas companies for the purpose of completing technology development and entering into the early stages of translating products into a business. The stage of KTEC investment is not only pre-bank financing, but also pre-venture capital, as the private equity market does not typically invest in product development and market entry. The role of such financing is to buffer the risk which small companies incur when developing innovative products, giving Kansas a broader pipeline of potential high growth companies.

	2007	2008	2009	TOTAL
New Jobs	133	260	83	476
Jobs Saved/Retained	101	49	76	226
Total Jobs	234	309	159	702
Total Revenues	$69,131,820	$117,206,494	$84,537,609	$270,875,923
Capital from Angels & VC	$29,159,979	$33,967,057	$24,455,063	$87,582,099
Federal $ Leveraged	$370,703	$1,607,414	$154,768	$2,132,885

KTEC

4-17

Access To Capital

Angel Tax Credits

The program provides angel tax credits to new and existing small Kansas companies for the purpose of attracting capital investment. The cost of researching and developing new technology with global market potential far exceeds the means of most entrepreneurs. The program promotes angel investing into Kansas early- stage companies through a tax incentive. The incentive effectively reduces the risk to the investor, making the overall investment into the company more financially attractive.

	2005	2006	2007	2008	Total (from inception)
Total Angel Tax Credits Issued	$1,932,500	$1,833,833	$3,002,701	$6,606,083	$13,375,117
Number of Investors Receiving Credits	98	121	129	218	566
Number of Companies Receiving Investments	12	17	16	28	73
Total Capital Raised	$9,245,753	$27,656,188	$44,486,719	$37,437,499	$118,826,159
Total Annual Payroll	$5,814,987	$7,695,310	$15,559,743	$22,426,253	$51,496,293
Total Revenue	$5,804,987	$17,864,942	$38,347,350	$57,409,422	$119,426,701
Jobs					
New Jobs	37	33	55	122	247
Preserved Jobs	60	9	19	48	136
Total	97	42	74	170	383
Estimated Effect on the Kansas Economy (factor of 2.5)	243	105	185	425	958

KTEC

4-18

Mid-America Manufacturing Technology Center (MAMTC)

MAMTC is a not-for-profit corporation (subsidiary of KTEC) established to assist Kansas small and mid-sized manufacturers. Funded by KTEC, the federal government and client fees, MAMTC is committed to helping Kansas manufacturers. MAMTC serves all existing Kansas manufacturers that have from one to 500 employees.

MAMTC helps close the loop on research, innovation and entrepreneurial support by ensuring that products are manufactured in Kansas. MAMTC operates the Kansas Innovation Marketplace as one of only four state sites on the National Innovation Marketplace. MAMTC trains universities, inventors and entrepreneurs to translate their technology into business language. The marketplace allows manufacturers to search through the technologies for new products to bring to market. Additionally it can connect suppliers, who have often depended on one customer for years or decades, to large manufacturers in new industries, thus allowing them to diversify and grow.

	2007	2008	2009
New Jobs	113	103	155
Jobs Saved/Retained	253	358	223
Total Jobs	366	461	378
Total Revenues	$57,686,404	$33,793,180	$42,541,681
Federal $ Leveraged	$1,485,264	$1,611,847	$1,746,200
Cost Savings	$8,745,200	$9,624,460	$14,476,490
Industrial Plant & Equipment	$16,884,000	$14,615,842	$17,022,428

KTEC 4-19

Kansas Tech-Based Economic Development

What	Eminent Scholars	Proof of Concept Grant	Matching Grants (SBIR/STTR)	Matching Grants (DOE, NIH, DOD, etc) - EPSCor State Match	Matching Grants (DOE, NIH, DOD, etc) - Other State Match	Inter-Institutional Research	Cancer Research	Research Innovations Translated to Marketable Products	Capital Expenditures (Bldgs/Equip)	Capital (Equity) Investment	Capital Needs Assessment/Assistance	Business Assistance - Strategy /Bus Plan Writing /Mkt Analysis	Business Assistance - Licenses/Permits/Filings	Entrepreneurial Education/Collaboration	Workforce, CDC, Mainstreet & Other Training	Equity Investment Tax credits	Job Creation & Capital Ex Tax Credits	Loans with a Match from CDC, KS Mainst or Other Public Sector Entity	Loans without Required Match	Facilitate Access to State Resources	Retention & Expansion Programs	Retention & Expansion Direct Services (mkt analysis, strategy, etc)	Business Recruitment	Workforce Training
Who																								
Med/Large Businesses									Comm		SBDC	SBDC	NetW	SBDC	Comm		Comm		Comm		Comm	SBDC	Comm	Comm
Small Businesses									NetW		SBDC	SBDC	NetW	SBDC	Comm		Comm	NetW	Comm		Comm	SBDC	Comm	Comm
Entrepreneurs - Start-ups:																								
Non High Tech/Bio									NetW		SBDC	SBDC	NetW	SBDC	Comm		Comm	NetW	Comm		Comm	SBDC	Comm	Comm
High tech		KTEC	KTEC							KTEC	KTEC	KTEC	NetW	KTEC		KTEC	Comm		Comm					
Bio Start-ups/Companies		KBA	KBA		KBA	KBA	KBA		KBA				NetW	KTEC		KTEC	Comm		Comm		KBA			
Research:																								
Universities	KBA		KBA	KTEC	KBA	KBA	KBA	KTEC	KBA															
Bio Centers of Innovation	KBA	KBA	KBA		KBA	KBA	KBA	KBA	KBA															

David D. Kerr, Secretary of Commerce

Kevin Carr, KTEC Interim CEO

Tom Thornton, President and CEO KBA

Wally Kearns, KSBDC State Director

Steve Radley, Director Network Kansas

Kansas Department of Commerce
Kansas Bioscience Authority
Kansas Technology Enterprise Corp.
Network KS (thru CDCs, Regional Foundations & KS Mainstreet)
Small Business Development Center

Overlap KTEC&KBA - under discussion
All Economic Development Agencies Listed

SITAKS

The voice of the Kansas software and IT industry

Our Mission

SITAKS is designed to lead, serve, educate and advocate for Kansas' software and information technology sector to help Kansas' software and IT companies grow and succeed.

State of the IT Industry in Kansas

According to the 2009 TechAmerica Cyberstates report:

- There are 3,200 software and IT companies in Kansas
- Employing over 58,000 high-wage technology workers
- Kansas' software/IT companies contribute more than $4.2 billion to the local economy
- Kansas' software and IT companies pay 91% more than the state's average wage ($72k vs. $37k)
- According to a survey of the SITAKS membership conducted by SITAKS in September, 2009 nearly all the companies surveyed anticipated hiring IT workers in the next five years (one larger company reported needing to hire as many as 250). 72% of companies surveyed indicated they require a Bachelor of Science or higher degree for their IT workers.
- Many of our member companies are reporting healthy growth in 2009 and are hiring workers.

Proven Formula for TBED - Software/IT Sector Growth:

- Access to angel and venture capital
- Access to a skilled workforce
- University research/vibrant tech transfer environment
- Supportive business environment

SITAKS 2010 State Legislative Platform

- Angel Tax Credits: Eliminate the 10% reduction of carry forward inserted in last year's HB2365 which greatly diminishes the attractiveness of the ATC program to investors.
- Angel Tax Credits: Provide a longer runway for software and IT companies. Currently, software/IT companies need to be less than 5 years old to be considered eligible for investment. As comparison, the current eligibility criteria for Bioscience companies is ten years.
- STEM: Add back "Computer Science" as one of the approved units in either the mathematics or natural sciences university qualified admissions requirements. The Kansas Board of Regents removed the Computer Technology requirement from the Qualification Admissions curriculum.

KTEC
10-7+8-09
Attachment 5

ICC & Centers - Total Budget Information

FY09 Estimated actuals

	KTEC	Industry	Federal & Other	Total	KTEC %
AMI	635,602	1,065,682	542,086	2,243,370	28%
BIOC	1,072,589	82,166	354,141	1,508,896	71%
ITTC	556,927	459,982	3,443,330	4,460,239	12%
KPRC	310,254	712,280	328,693	1,351,227	23%
NIAR	459,833	11,476,932	17,035,634	28,972,399	2%
	3,035,205	13,797,042	21,703,884	38,536,131	8%

FY09 Budget

	KTEC	Other	Local Govt	University	Total	KTEC %
ATC	58,000		50,000	10,000	118,000	49%
ECJC	289,328	778,690	332,175		1,400,193	21%
KUMCR	55,937					
LRTC	297,043	112,648	5,000	50,000	464,691	64%
NISTAC	289,328	1,240,600		630,000	2,159,928	13%
Quest	35,000	78,940	100,000		213,940	16%
WTC	303,794	114,000			417,794	73%
	1,328,430	2,324,878	487,175	690,000	4,774,546	28%

KTEC
10/7-8/09
Attachment 6

Evaluation of Kansas Technology Enterprise Corporation (KTEC)

KTEC Evaluation: The Objective

This study attempted to address the following three questions:

1. Is KTEC adhering to its statutory obligations?
2. Has KTEC initiated its statutorily defined programs and initiatives?
3. What have been the outcomes of the KTEC investments?

Special Interim Committee on KTEC
Date: October 7, 2009
Attachment 7

KTEC Evaluation: What is KTEC?

KTEC was created by the Kansas legislature in 1987 "to foster innovation in existing and developing businesses, especially the creation, growth and expansion of Kansas enterprises in a diversified range of primary sectors, which develop value-added products, processes and services including, but not limited to:

1. Existing resource-based industries of agriculture, oil, gas, coal and helium;
2. Existing advanced technology industries of aviation, pharmaceuticals, computers and electronics; and
3. Emerging industries of telecommunications, computer software, information services and research services."

KTEC Evaluation: The Process

- Ninety interviews with select stakeholders of KTEC
  - Interviews indicated a broad range of attitudes about KTEC.
  - Few interviewees had a grasp of the organization, but rather a unique opinion on the organization based on their interaction with KTEC personnel, programs, and resources.
- Examination and analysis of previous reports conducted by the Research Triangle Institute (RTI),the state audit agency (LPA), and KTEC annual reports.
- Gathered and examined data from various national groups and agencies, including the Association of University Technology Managers, the State Science and Technology Institute, and the Kauffman Foundation.

KTEC Evaluation: The Observations

- KTEC used its influence to expand the declared role of universities to cover economic development activities.
- KTEC had significant participation in the development of the 2004 KEGA legislation and subsequent creation of the Kansas Bioscience Authority.
- Successful exits of several Kansas-based companies (realized return on investments).
- KTEC assisted in recruiting promising technology companies to Kansas (e.g., Deciphera in 2003, Inverseon in 2004, Ventria in 2006, and Edenspace in 2007).
- Increased interaction among the members and affiliates of the KTEC TBED community.
- Disappointing, inconsistent, or misleading metrics upon which to gauge performance.
- Continued support for organizations based on political or geographic "balance" rather than merit.

KTEC Evaluation: Interview Common Themes

1. KTEC's Role In Kansas

- Lack of comprehensive overview of KTEC and what it does, or is supposed to do.
- Lack of awareness to KTEC's influence in keeping technology based companies in Kansas.
- KTEC identified as the 'hub' of the technology network in Kansas.
- KTEC is a 'one-stop'assistance for entrepreneurs.
  - This has become a by-product of KTEC's activities
  - KTEC has become the place to call for entrepreneur assistance: not that they 'do it all' but that they know who to call

KTEC Evaluation: Interview Common Themes

2. KTEC Board Members

- Many board members who are not members of the Executive Committee or officers expressed they are only allowed to operate in an advisory capacity.
- Lack of detailed board information either prior to or during board meetings is a particularly troublesome issue.
- Indication that board meetings feel contrived, i.e., conclusions are pre-defined and there is little or no substantive discussion during the meetings.

KTEC Evaluation: Interview Common Themes

3. Kansas' Technology Clusters

- Inability to identify KTEC's focus beyond 'technology'.
- Could not specify areas where Kansas might develop unique intellectual and economic assets.
- 'Ag-bio' or some form of agricultural-based technology was cited by a number of interviewees as a potentially unique opportunity for Kansas that KTEC should be taking a leadership role on.
- Animal health and medicine was cited as an area where Kansas, particularly the Western portion of the state, has some assets that are not being sufficiently exploited.
- Optimism that KTEC could become more of a platform for cross-technology collaboration, e.g., ag-bio and green energy, or soy technology and polymers or helping to facilitate cross industry collaborations.

KTEC Evaluation: Interview Common Themes

4. KTEC's Programming

- Program participants are almost universally positive when speaking about the experience and support they have received through KTEC programs.
- Pipeline Program receives very positive reviews from participants.
- Entrepreneurs who have received the benefit of angel investment tax credits are positive about process used to validate the business, as well as the end result.
- Receiving a positive endorsement by KTEC, with or without funding as a result, is perceived to be a 'stamp of approval' for venture capitalists.

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KTEC Evaluation: Interview Common Themes

5. KTEC Operations

- Procedures at KTEC are not transparent. KTEC referred to as a 'black box'.
- Many references were made to difficulties with getting information from KTEC or with understanding how decisions were made within the organization.
- Lack of promotion and lack of marketing.
- Lack of communication; there is a concern that KTEC staff does not provide extra effort to inform, educate, and explain KTEC's mission and progress to legislators.

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Building Assets through Knowledge & Innovation

KTEC Evaluation: Interview Common Themes

6. KTEC Progress

- General sense that the creation of KTEC has enabled Kansas to get in and stay in the "technology game."
- Lack of ability to articulate success metrics for KTEC and whether KTEC was making measurable progress on specific items.
- Interviewees were able to articulate KTEC's function of growing technology businesses in Kansas, but couldn't provide specific examples.
- Emerging concern about whether KTEC is providing appropriate leadership for commercialization of university research.
- Return on investment on start-up companies versus investing the same dollars in attracting or growing existing companies.
- Perception that KTEC tries to be "all things to all people.

KTEC Evaluation: Interview Common Themes

7. KTEC Structure and Operations

- A simple organization chart will not describe KTEC adequately.
- KTEC's relatively small staff leverages its relationships with subsidiaries and affiliates across the state to gather and broker information, match entrepreneurs and researchers, and encourage the forward progress of commercialization projects.

Innovation Phase I

Idea and Product Formation: University Programs

- KTEC supports university-based Centers of Excellence.
  - Not all Centers of Excellence perform equally well.
  - The high-performing centers show a pattern of increased contribution from private industry as a percentage of operating budget, making KTEC's financial participation marginally significant.
  - Need to identify how to address underperforming centers.
  - KTEC channels state dollars to support university proposals that require state contributions.
  - Experimental Program to Stimulate Competitive Research (EPSCoR)
  - Kansas Strategic Technologies Research Fund (STAR)
    - The Star Fund projects have a much higher leverage ratio (federal plus industry to state dollars) than do EPScoR projects.

Innovation Phase II

Business Formation: Incubators and Entrepreneurs

- Business incubators play a role in taking intellectual property (IP), often developed at a university, to the commercialization launch point.
- Business assistance incubator program activities typically enter the innovation life cycle at the commercialization stage.
- Although resources associated with the incubator programs are typically based in university towns, on campus, and have close ties with university personnel, the client population is more heavily skewed toward non-academic entrepreneurs.
- KTEC gives financial support to eight business incubators. A ninth, the Mid-America Manufacturing Technology Center (MAMTC), is a wholly-owned subsidiary.

Innovation Phase II

Business Formation: Incubators and Entrepreneurs

- The KTEC Pipeline program is entering its third year.
- An unique program in the US, it provides a generous subsidy for entrepreneurs who attend 12 formal and multiple informal sessions to learn more about the business side of product commercialization and capital financing.
- Difficult to project its future impact, success should identify outcomes rather than activities and be counted appropriately.
- The Pipeline program joins other entrepreneurship programs in and around the state, some of which are university-based and others foundation-based.
- The Ewing Marion Kauffman Foundation
  - Kauffman program dwarfs any other: 300,000 entrepreneurs have graduated since 1993

Innovation Phase III

Equity Investment and Angel Tax Credit Programs

- Original KTEC statute states KTEC should play a significant role in capital formation at the seed stage.
- KTEC's strategy for funding pre-revenue companies has evolved over the years: from loans and grants to royalty and equity positions. The types of companies targeted have also evolved over the years. Because there is no market for the investments that make up KTEC's portfolio, companies remain in that portfolio until the company terminates operations or exits via trade sale or acquisition, IPO, or liquidation of assets.
- KTEC's portfolio as of March 2009 stood at $9.147 million, with 45 active companies in which KTEC made investments between 1997 and December 2008.

Innovation Phase III

Equity Investment and Angel Tax Credit Programs

- KTEC makes investments through two State-funded instruments:
  - -Applied Research Matching Fund (ARMF)
  - -Technology Commercialization Seed Fund (TCSF – established 2003)
- Between 1988 and 2006, the number of companies receiving financial assistance in a single year has ranged from a low of 9 (2006) to a high of 41 (1992).
- Beginning in 2002, the number of investments per year has not exceeded 13 companies.
- Earnings realized through KTEC's wholly owned subsidiary, KTEC Holdings, are used to augment these investment funds.

Innovation Phase III

Equity Investment and Angel Tax Credit Programs

- In 2004 Kansas Economic Growth Act (KEGA) legislation, KTEC was designated administrator for the newly created Angel Investor Tax Credit program.
- It has qualified 40 companies under this program that encourages capital formation by reducing risk to investors.

Indicators of Success: Intellectual Property

Association of University Technology Managers (AUTM):
Kansas Results

2006 AUTM Survey-Kansas Results		
Licenses	Issued Patents	License Revenue
19	9	$1.6 Million

2006 AUTM-Neighboring States			
Institution	Licenses	Issued Patents	License Revenue
University of Utah	62	20	$16.3 Million
Oklahoma	22	29	$4.5 Million
Missouri	57	26	$14 Million

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Indicators of Success: Venture Capital

Investment Dollars by State (as reported by Money Tree)	
Kansas	$602 Million
Missouri	$2,240 Million
Oklahoma	$487 Million
Utah	$2,729 Million
Nebraska	$591 Million
Colorado	$ 13,097 Million

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Indicators of Success: Foundations of Economic Development

Kauffman Foundation New Economy Index Kansas Rankings	
Entrepreneurial Activity	Kansas ranks 41st
Inventor Patents	Kansas ranks 36th
Scientists & Engineers	Kansas ranks 39th
Non-Industry Investment in R&D	Kansas ranks 39th
IPO's	Kansas ranks 41st
Gazelle jobs (fast growing jobs)	Kansas ranks 8th
Industry Investment in R&D	Kansas ranks 28th
Venture Capital	Kansas ranks 23rd

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Conclusions and Recommendations

Conclusions

1. Kansas needs a focal point for entrepreneurs and innovators.
   - During interviews, many stakeholders could not imagine Kansas having an entrepreneurial presence without KTEC. They feel that KTEC is the hub of the entrepreneurial network in the state.
   - KTEC could do more to build the entrepreneurial business climate in Kansas.
   - KTEC could be more actively engaged in convening multiple universities to facilitate cross-technology innovation and to actively facilitate commercialization of university research.

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7-11

Conclusions and Recommendations

Conclusions

2. KTEC needs a clear vision of its role in building a successful Kansas economy.
   - The KTEC model as originally envisioned is solid. The current execution of the model, however, is not fulfilling the intent and vision of the original model.
   - Metrics for KTEC are not clearly established, nor are they regularly and consistently measured and reported. Therefore, it is difficult to speak quantitatively about the impact KTEC has had on the Kansas economy.
   - The qualitative difference that KTEC has made by building capacity for shared intellectual discovery and business assistance is difficult to measure.
   - KTEC should not unnecessarily promote itself but promote the Kansas entrepreneurial climate and legitimate successes.

Conclusions and Recommendations

Conclusions

3. KTEC needs more consistent guidance.
   - KTEC does not have an operational definition of 'technology-based economic development' to guide its investment decisions and programs.
   - The operation of The Board of Directors is less active than is prescribed in the enabling statutes.
   - Currently, KTEC's portfolio seems unfocused. 'Technology' is too broad a focus for KTEC, the Kansas Bioscience Authority has been created to concentrate on bioscience technology, and other technology platforms may be falling through the cracks due to insufficient attention.
   - KTEC should look for concentrations of emerging technology and focus on areas where Kansas can develop a leadership role.

7-12

Conclusions and Recommendations

Recommendations

- KTEC should mount an effort to identify unique technology clusters in Kansas around which the innovation economy can be built. Some interviewees identified animal health, embedded systems, and plastics as some potential opportunities.
- KTEC needs to establish a clear and uniform set of metrics, collect and maintain information that supports these metrics, and regularly report progress. Metrics should reflect outcomes rather than activities.
- Publish current and past annual reports to the KTEC website.
  - Incorporate details into annual reports that anticipate "frequently asked questions" received from legislators.

Conclusions and Recommendations

Recommendations

- KTEC needs mechanisms in place to assure that The Board of Directors is fulfilling its fiduciary role and is operating in accordance to statute.
  - Encourage Board members and their delegates to take a more active role in decision-making.
  - For example, investment recommendations should be presented by an Investment Committee member, rather than by KTEC staff. The committee is then responsible for making the recommendation; KTEC staff is responsible for managing the process and providing information and analytical support as requested by The Board.

Conclusions and Recommendations

Recommendations

- Provide thorough and adequate information to The Board well in advance of board meetings to enable them to be appropriately informed. Board members must be qualified and informed to be able to fulfill their statutory duties.
- Maintain the integrity of the Board nomination and selection process.
- Work with existing companies to identify "orphan" technologies and identify employee mentors/interns/students that could develop them to the proof-of-concept stage.
- Leverage existing entrepreneurship programs and evaluate the KTEC Pipeline model.

Conclusions and Recommendations

Recommendations

- Build Board capacity to ensure that entrepreneurs, technology experts, intellectual property attorneys, and financial experts are represented on The Board.
  - Structure The Board with a past member of KTEC staff, at least one entrepreneur who never has (and probably never will) go to KTEC for funding.
  - Implement a rotation system for the Investment Committee so that expertise is developed and concerns about closed group decision-making are allayed.
  - Consider downsizing The Board and create a Governor's Technology Roundtable that meets the political needs for balance.

KTEC's Response to the Kansas, Inc. Evaluation
Legislative Interim Session
October 2009

1. **Thomas P. Miller & Associates (TPMA) recommendations:**

   The TPMA assessment supports KTEC remaining intact, separate from other agencies and fully functioning. The assessment validates the mission and accomplishments, and at the same time makes a series of actionable recommendations. Among the important recommendations is that KTEC not be dismantled or folded into other agencies.

Further recommendations:

2. KTEC should continue to identify unique technology clusters in Kansas around which the innovation economy can be built. Some interviewees identified animal health, embedded systems, and plastics as potential opportunities.

KTEC Response:

- KTEC formed a Strategic Planning Task Force in June, which includes the following members; Kevin Carr, KTEC Interim CEO; Board Chair Kyle Elliott, Spencer Fane Brit & Browne; Board members David Kerr, Secretary of Commerce; Senator Tom Holland; Tom Lauerman, entrepreneur; David Brant, Cessna Aircraft; Dr. David McDonald, Wichita State University; and Ted Haggart, Douglas County Bank. The task force identified cluster development as one of the four focus areas for the agency. KTEC has started developing the next cluster by applying for an EDA grant and setting aside funds to match that grant. The grant funds will be used to hire a consultant to evaluate Kansas resources. The technology cluster strategy development will assess both urban and rural capabilities to help determine the best statewide cluster to focus limited resources.

- In September, KTEC started a full evaluation of the Centers of Excellence. The Centers have been asked for a variety of information and will present findings to the Strategic Planning Task Force on November 13th. The purpose of the exercise is to determine each Center's alignment with KTEC's strategy going forward, to evaluate performance to date, and to assess funding requirements.

KTEC Centers of Excellence:

- Advanced Manufacturing Institute (AMI) at Kansas State University focuses on product design and engineering, automation, and manufacturing process development, and technology development and commercialization.

- Biotechnology Innovation & Optimization Center (BIOC) at the University of Kansas provides a centralized focus for moving technologies into the private sector from pharmaceutical and biomedical research on both the Lawrence and Medical Center campuses.

- Information & Telecommunication Technology Center (ITTC) at the University of Kansas is focused on the areas of computing, communications, and sensors.

- Kansas Polymer Research Center (KPRC) at Pittsburg State University focuses on design, testing, and development of products and processes with respect to polymers and plastics.

- National Institute or Aviation Research (NIAR) at Wichita State University serves the aviation industry in Kansas by providing research, training, product development, and testing facilities.

3. KTEC needs to establish a clear and uniform set of metrics, collect and maintain information that supports these metrics, and regularly report progress. Metrics should reflect outcomes rather than activities.

KTEC Response:

- It is unclear why there is a recommendation regarding metrics, as the assessment did not include interviews with staff or examination of documents related to measurement processes and results. KTEC gathers a well-defined set of verifiable annual economic impact data, which is published in the annual report on the web site.

- It was evident in the assessment that KTEC staff needed to improve reporting of metrics to the board. Historically, metrics were provided to the board as a component of the annual reportBeginning September 11, 2009, the metrics are now reviewed annually in detail at the board meeting immediately following the conclusion of the survey process. This review should help ensure that the board has a better awareness and understanding of the KTEC metrics, as well as an opportunity to ask questions and have direct impact on the process.

- Companies receiving KTEC support are surveyed annually. This information is summarized by staff and is used along with quarterly reports and client meetings to track client progress and customize services. Indicators are new jobs, saved jobs, payroll, revenues, and capital infusion.

- Angel Tax Credit companies are surveyed annually. Information is summarized and shared with the Governor, Legislature and KTEC Board. The companies are surveyed on new jobs, saved jobs, payroll, revenues, and capital infusion.

- Manufacturing program clients are surveyed one year after project completion, in accordance with a process set by the federal co-sponsor of the program. Metrics include cost saving in production, investment in plant, equipment and information systems, investment in workforce training, new sales, retained sales, new jobs created, and retained jobs.

- Performance metrics are also collected on the Centers of Excellence, Business Assistance Incubators, the PIPELINE program, and EPSCoR/Star Fund recipients.

	Grant Programs	Centers of Excellence	Entrepreneurial Centers	KTEC Investments	Angel Tax Credits	Pipeline	MAMTC
New Jobs							
Saved Jobs							
Payroll							
Revenue							
Capital Infusion							
Companies Assisted							
Federal Leverage							
Industry Leverage							
Cost Savings in Production							
Costs Avoided							
Investment in Work Force Training							
Plant & Equip Investment							
New Sales							
Retained Sales							
Number of Proposals							
Number of Participating Students							

4. KTEC could better serve its stakeholders and foster a more entrepreneurial culture in Kansas by posting all annual reports, schedules, minutes, etc. online, as would providing more materials to board members in advance of meetings.

KTEC Response:

- Since April, KTEC has posted all annual reports, the last three years of minutes, and future schedules on the KTEC.com web site. Board materials are supplied at least two days prior to the board meeting and posted on the new board intranet site.

- KTEC and other technology-based economic development agencies created a collaboration matrix to help the Legislature, This document provides the Administration and Kansas citizens a better understanding of how all of the agencies work together to provide tech-based economic development.

5. KTEC needs mechanisms in place to assure that the Board of Directors is fulfilling its fiduciary role and is operating in accordance to statute. Encourage Board members and their delegates (e.g., members of the Board Investment Committee) to take a more active role in decision-making. For example, investment recommendations should be presented by an Investment Committee member, rather than by KTEC staff. The committee is responsible for making the recommendation; KTEC staff is responsible for managing the process and providing information and analytical support as requested by the Board.

KTEC Response:

- KTEC surveyed all board members prior to the June meeting to ensure their needs were understood and being met. An action plan was put in place and most of the raised items were addressed prior to the September board meeting. The action plan and steps taken were presented to the board at the September meeting. The board will be surveyed bi-annually as to its satisfaction on this action.

- KTEC developed an intranet site for board members that includes: Committee charters, board contact information, meeting materials, meeting dates, reference materials, and other relevant board data. This site is actively maintained and archives prior meeting information for easy access.

- At the June KTEC Board meeting, board members were placed on each KTEC committee to ensure more committee participation by the board.

- The KTEC board formed a Strategic Planning Task Force in June that presented a renewed strategy to the board in August. The task force is comprised of eight members: Kevin Carr, KTEC Interim CEO; KTEC Board Chair Kyle Elliott, Spencer Fane Brit & Browne; ; Board members David Kerr, Secretary of Commerce; Senator Tom Holland; Tom Lauerman, entrepreneur; David Brant, Cessna Aircraft; Dr. David McDonald, Wichita State University; and Ted Haggart, Douglas County Bank. Strategy discussion in August led to the board's approval of the budget submission to the administration at the September board meeting.

6. Provide thorough and adequate information to the Board well in advance of board meetings to enable them to be appropriately informed. Board members must be informed to be able to fulfill their statutory duties.

KTEC Response:

KTEC posts all materials that require board approval to the board intranet site two days in advance of each meeting.

7. Maintain the integrity of the Board nomination and selection process.

KTEC Response:

- The process is controlled by the Legislature and Governor. No problems related to the nomination and selection process were cited in the report.

8. Build Board capacity to ensure that entrepreneurs, technology experts, intellectual property attorneys, and financial experts are represented on the board. Structure the board with at least one entrepreneur who never has (and probably never will) go to KTEC for funding. Implement a rotation system for the Investment Committee so that expertise is developed and concerns about closed group decision-making are allayed. Consider downsizing the board and create a Governor's Technology Roundtable that meets the political needs for balance.

KTEC Response:

The charter of the Investment Committee was amended in June to include a term limit for all members. Five new committee members have been added since May. The current committee includes four board members.

The Board is comprised of members with the expertise specified by statute, and there is significant expertise on the board. For example:

- Entrepreneur Tom Lauerman co-founded GeoAccess in 1991. He and his business partner grew the software company to more than 300 employees. In 1999 Lauerman was named the Ernst & Young Entrepreneur of the Year, was recent President of the Kansas City-based Entrepreneurial Exchange, and is the 2009 recipient of Pipeline's "Entrepreneual Leadership Award". He is currently an investor in, and serves as board member and board advisor to many private companies. Tom has been on the KTEC board since 2006.

- Intellectual property attorney Kyle Elliott is a licensed patent attorney and certified mediator.Since graduating from the University of Kansas School of Law in 1992, Kyle has devoted his career exclusively to intellectual property law. Kyle has been on the KTEC board since 2006 and on the KTEC Investment Committee since 2002.

- Financial expert Ted Haggart is President and CEO of Douglas County Bank. Before joining DCB, Ted was President of Union National/Commerce Bank in Manhattan and Senior Vice President of First National Bank in Salina. He also was an economics professor at Kansas State University, Executive Director of the Kansas Economic Education Council and an economist for the U.S. Senate Budget Committee. Ted has been on the KTEC board since 2001 and has chaired business incubator boards in both Manhattan and Lawrence.

9. Work with existing companies to identify "orphan" technologies and identify employee mentors/interns/students that could develop them to the proof-of-concept stage.

KTEC Response:

KTEC's Proof of Concept (POC) program has been in existence for two years. KTEC has funded projects at WSU, KSU and KU totaling over $100,000.

10. Leverage existing entrepreneurship programs and consider extending the Pipeline brand to meet needs of entrepreneurs at different stages of development.

KTEC Response:

KTEC will continue to evaluate services directed to the entrepreneur. The report recognizes the fact that the KTEC PIPELINE has garnered significant praise and support of national thought leaders. The program supports entrepreneurs in several stages of development and has extended its offerings "upstream" through creation of

primer programs available to any Kansas entrepreneur and to high school students through collaboration with the Youth Entrepreneurs of Kansas.

Closing Comments:
While we believe it is important to provide clarifications on some of the key issues, we appreciate the recognition of the many positives noted in the report. KTEC has taken measures to deal with the issues addressed in the report and looks forward to continuing to evolve and help solidify Kansas' position in the innovation-based economy.

Sincerely,

Kevin M. Carr

Kevin Carr
Interim President & CEO
KTEC

Kenneth Frahm
Testimony regarding KTEC Investment Committee
10/7/09

- Kenneth Frahm, corn and wheat producer from Colby
- Held several appointive public service positions, including KDFA Pres. and Co-Chair Kansas Energy Council
- My favorite: 12 years of the KTEC Investment Committee
- In 12 years KTEC Investment process has gotten better and better!

- Better companies to invest in
- Better information
- Better decisions by the committee
- Better help for the companies and the committee from staff
- Better investment structure for KTEC

- Committee members include:
  - A "generalist" who can "see the forest despite the trees"
  - Early stage investment specialists
  - Information tech & other tech field people
  - Intellectual Property specialist
  - People with common sense and a healthy sense of skepticism

- Committee:
  - Receives detailed, pertinent and *confidential* information of considered company investments
  - Does NOT feel pressure by staff, or politicians when making investment decisions
  - Is truly independent
  - Studies all investment decisions individually and as a group very carefully
  - Sees, and often selects, opportunities from a wide variety of fields. Probably 2 biggest fields have been Software applications and medical technology

- My favorite example:
  - Edenspace
    - Bio tech firm creating GMO corn for cellulosic ethanol from the corn stover
    - Moved to Kansas because of KTEC investment
    - Currently working on a strategic partnership with corn seed company and a $35 million DOE grant for a demonstration level cellulosic ethanol refinery in partnership with ICM (Colwich, KS) and KSU

I've traveled from Colby to tell you how important I think KTEC is. Questions?

Special Interim Committee on KTEC
Date: October 7, 2009
Attachment 9

ksbdc
kansas small business development center
Growing Kansas Entrepreneurs

Kansas Small Business Development Center
214 S.W. 6th Street
Suite 301
Topeka, KS 66603-3719
(785) 296-6514
Fax (785) 291-3261
Toll Free 1-877-62K-SBDC or 1-877-625-7232
www.ksbdc.biz

To: Joint Economic Development Committee

From: Wally Kearns, State Director, Kansas Small Business Development Center WK

Date: October 6, 2009

Re: Kansas Technology Enterprise Corporation (KTEC)

I would like to express support for the Kansas Technology Enterprise Corporation (KTEC) and Centers of Excellence. KTEC has the core competencies to assist entrepreneurs and technology businesses with technology transfer and commercialization.

KTEC has increased their collaboration with other resources in the recent months and has taken the time to better understand existing resources. In addition, KTEC developed a Kansas Economic Development matrix (see attached) to educate constituents, resource partners, and other stakeholders involved in economic development. This matrix communicates the role of each resource and demonstrates the need for a diverse array of resources to meet the needs of all types of businesses across Kansas.

The KSBDC has met with KTEC three times in the past three months and also made a presentation to KTEC's Strategic Planning Task Force. During the meetings we discussed collaboration, metrics tracking, return on investment and cost effectiveness of services. The KSBDC also shared the following with the Task Force:

1. KTEC should be an independent program in order to respond to the unique technical, intellectual property issues, educational, marketing and capital needs of technology entrepreneurs and businesses.
2. KTEC should revisit the makeup, structure and role of their Board.
3. KTEC should continue to increase their collaboration with other resources

KTEC plays a key substantive technology role in growing Kansas' technology economy including direct counseling, raising capital, training, and marketing; KTEC services are not duplicated by other resources.

Please email ksbdc.wkearns@fhsu.edu or call me (785-296-6514) if you have any additional questions.

Special Interim Committee on KTEC
Date: October 7, 2009
Attachment 10

877.521.8600
NetWork Kansas
www.networkkansas.com
Resources for Starting or Growing Your Business

To: Joint Economic Development Committee

From: Steve Radley, Director, Kansas Center for Entrepreneurship (DBA NetWork Kansas)

Date: 10/6/2009

Re: Kansas Technology Enterprise Corporation

This memo is intended to express support for Kansas Technology Enterprise Corporation (KTEC) and the entire network. KTEC is a vital partner to NetWork Kansas and a key referral resource for technology-based entrepreneurs.

The KTEC network provides what we consider the three key resource elements—education, expertise, and economic resources—to the vital space of technology based entrepreneurship.

One example of this expertise is in the area of capital creation. Technology-based entrepreneurs have very specific needs in the area of capital creation that are vastly different from other businesses. The most prominent of these is the need for angel capital. KTEC has led the way by facilitating the growth of several angel networks across Kansas. Angel networks represent different types of investors who are looking for information that is vastly different from other types of capital resources (financial institutions, SBA, etc.). KTEC provides significant expertise that helps prepare entrepreneurs for the rigorous challenges associated with raising angel capital.

NetWork Kansas is also working with KTEC and Wichita Technology Corporation to develop a rural angel network to increase capital availability through Kansas. This would not be possible without KTEC's expertise in this area. KTEC is also a key referral resource in the area of product and technology invention. Commercialization partners such as the Advanced Manufacturing Institute and Alliance for Technology Commercialization provide key expertise not readily available in many areas of the state.

I recently presented to the KTEC task force to provide information about NetWork Kansas and any thoughts and/or recommendations concerning technology based entrepreneurship. I provided two thoughts: 1. KTEC, culturally, should operate independently for the following reason: A technology based company has different needs than other types of businesses such as manufacturers, service companies, retail businesses, etc. in terms of technical assistance and capital needs and 2. KTEC should streamline the reporting structure by reducing the number of board members: an entrepreneurial organization should be structured in an entrepreneurial manner. (Example: Google and Apple only have 6 and 7 outside board members respectively)

In conclusion, KTEC represents a significant group of partners in our network that provide key expertise, education and economic resources not readily available by other sources. If you have any questions or I can be of further assistance, please drop me a note at sradley@networkkansas.com or call 316-218-6304.

Sincerely,

Steve Radley
Director, NetWork Kansas
A Service of the Kansas Center for Entrepreneurship

KTEC
10/7-8/09
Attachment 11

Technology-Based Economic Development in Kansas

Toward a New Strategic Vision

Prepared for Kansas, Inc. by
Art Hall, Executive Director
Center for Applied Economics, KU School of Business

Presented to the Special Committee on Kansas Technology Enterprise Corporation (KTEC)

October 8, 2009

Major Themes:

- Kansas has performed well in the growth of "high-tech" businesses. Following the recession of 1991, the rate of growth has exceeded that of the nation and the Plains states.

- Technology-based economic development is primarily an urban phenomenon.

    - Volume matters. Innovation is a "numbers game" because it is an inherently risky enterprise that requires a lot of trial and error. Success is the goal but failure is a key aspect of the overall discovery process.

    - Density matters. Dense populations and dense commercial activity help support volume. But more importantly, they assist the innovation process by making it less costly to experiment. A key virtue of density related to innovation is the ease with which diverse groups of people can interact face-to-face. Such interaction breeds ideas and makes it easier to communicate—and develop—hunches.

    - Kansas has natural disadvantage in the areas of volume and density, except for Kansas City and, secondarily, Wichita. Dealing with this disadvantage is an appropriate focus of state policy.

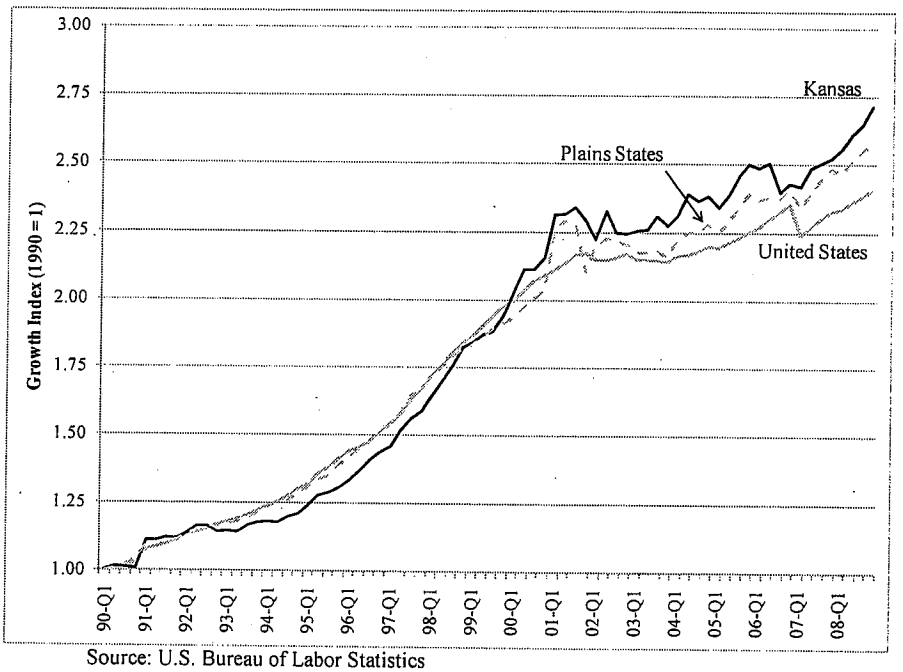
- We need to think much bigger. A new strategic vision can expand our potential. The overall thrust of Kansas policy may work against (rather than with) the key forces of volume and density.

KTEC
10/7-8/09
Attachment 12

Documenting Success in Kansas

- Chart 1 below demonstrates that Kansas has generally experienced faster growth in "high tech" businesses than both the nation and the Plains region.
- The Kansas, Inc. report defines high-tech by collating the industry definitions from four sources: A U.S. Treasury Department report, a State Science and Technology Institute report, an American Electronics Association report, and the bioscience definitions from the Kansas Economic Growth Act of 2004.
- Most of the growth has occurred around Kansas City—the counties of Douglas, Johnson, and Leavenworth. Johnson County accounts for about 50 percent of all "high tech" businesses in Kansas (and about 30 percent of the employment). Wichita accounts for 17 percent of the businesses (and about 55 percent of the employment).

Chart 1: Quarterly Growth of *Select* "High Tech" Business Establishments, 1990-2008



Source: U.S. Bureau of Labor Statistics

3,300 business
250,000 ees

- Table 1 below provides a detailed list of industry sectors that have performed well in Kansas since 1990. The rankings are based on a multipart test defined in the report. The test uses a variety of measures to determine sectors that have performed well in Kansas compared to other states—with a bias toward more recent performance and greater levels of employment. Sectors that have higher levels of employment but a lower rank indicate that it had lower test scores compared to sectors with high ranks and less employment. (The bold text items are bioscience per the Kansas Economic growth Act.)
- The key take-away from Table 1 is the impressive diversity and volume of high tech activity in Kansas.

12-2

Table 1: Rank of Top Performing "High Tech" Industries in Kansas, 1990-2008

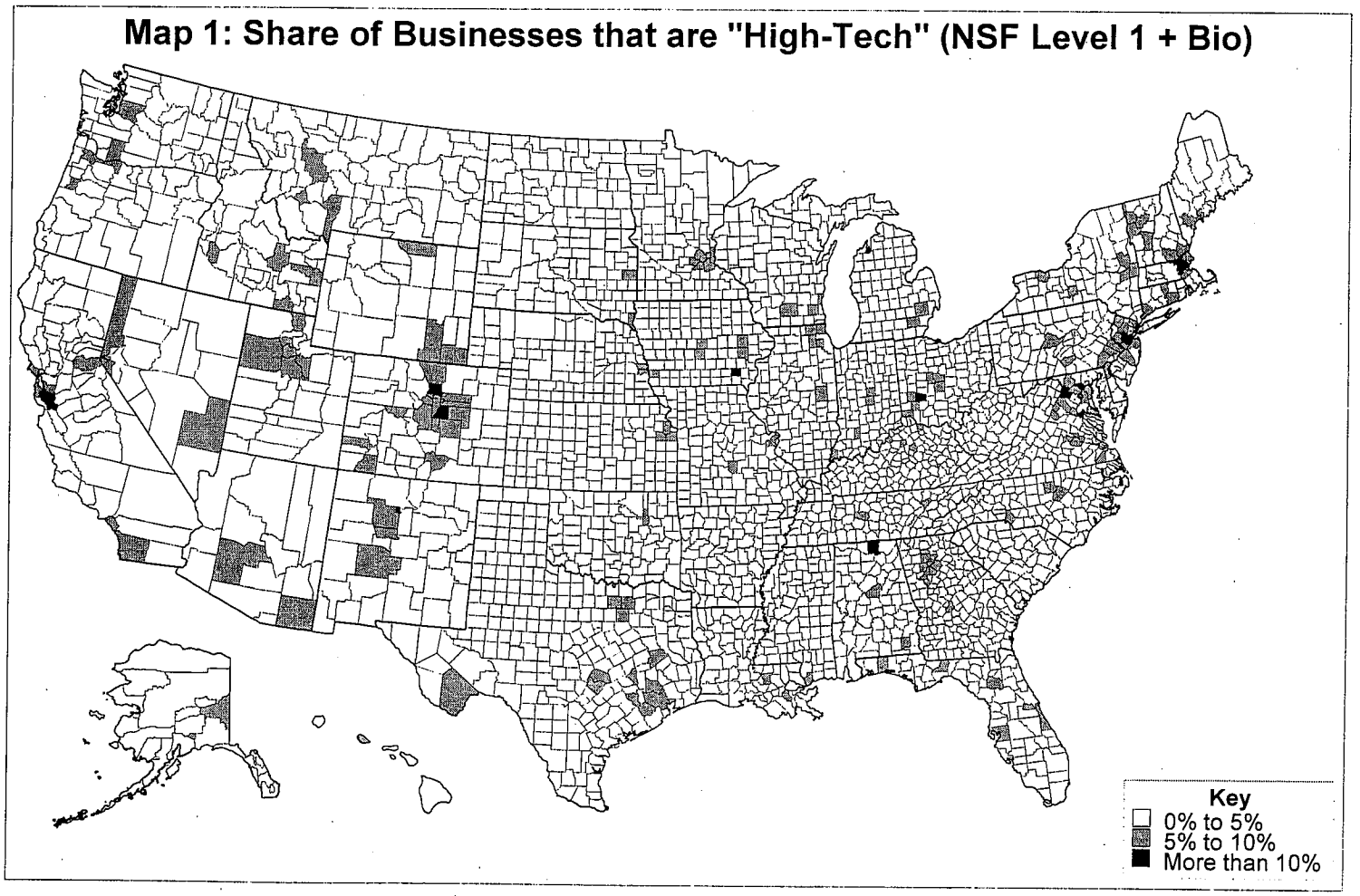
Rank	Industry Name (6-Digit NAICS Code)	2008 Business Count	2008 Estimated Job Count
1	Cellular and Other Wireless Telecommunications	151	13,172
2	**Medical Laboratories**	119	11,475
3	Aircraft Engine and Engine Parts Manufacturing	13	4,914
4	All Other Motor Vehicle Parts Manufacturing	20	5,355
5	Custom Computer Programming Services	636	11,406
6	Drilling Oil and Gas Wells	102	5,590
7	Truck Trailer Manufacturing	13	3,893
8	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	9	2,266
9	Software Publishers	53	4,596
10	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables	12	1,412
11	**Pharmaceutical Preparation Manufacturing**	10	4,071
12	**All Other Basic Organic Chemical Manufacturing**	9	1,126
13	All Other Basic Inorganic Chemical Manufacturing	7	905
14	Computer Storage Device Manufacturing	4	1,203
15	All Other Miscellaneous General Purpose Machinery Manufacturing	16	1,288
16	**Research and Development in the Physical, Engineering, and Life Sciences**	90	2,562
17	Electronic Coil, Transformer, and Other Inductor Manufacturing	3	630
18	Other Measuring and Controlling Device Manufacturing	8	1,215
19	Motor Vehicle Body Manufacturing	20	2,714
20	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	16	437
21	**Biological Product (except Diagnostic) Manufacturing**	10	653
22	Computer Training	28	392
23	Fiber Optic Cable Manufacturing	1	375
24	Computer Facilities Management Services	30	995
25	**Ethyl Alcohol Manufacturing**	15	265
26	Internet Service Providers	31	251
27	**In-Vitro Diagnostic Substance Manufacturing**	2	749
28	**Surgical Appliance and Supplies Manufacturing**	28	1,495
29	Other Computer Related Services	56	1,406
30	**Laboratory Apparatus and Furniture Manufacturing**	4	175
31	**Pesticide and Other Agricultural Chemical Manufacturing**	4	175
32	Web Search Portals	6	176
33	Motor Vehicle Transmission and Power Train Parts Manufacturing	4	122
34	Totalizing Fluid Meter and Counting Device Manufacturing	5	170
35	Custom Compounding of Purchased Resins	5	63
36	**Nitrogenous Fertilizer Manufacturing**	4	176
37	Optical Instrument and Lens Manufacturing	4	55
38	Printed Circuit Assembly (Electronic Assembly) Manufacturing	6	77
39	Other Communications Equipment Manufacturing	6	149
40	Other Electric Power Generation	9	67
41	Other Pressed and Blown Glass and Glassware Manufacturing	5	60
42	Telephone Apparatus Manufacturing	13	588
43	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use	5	37
44	**Analytical Laboratory Instrument Manufacturing**	12	51
45	**Electromedical and Electrotherapeutic Apparatus Manufacturing**	16	37
46	Other Aircraft Parts and Auxiliary Equipment Manufacturing	120	19,233
47	Computer Systems Design Services	747	15,830
48	Architectural Services	188	5,042
49	**Diagnostic Imaging Centers**	59	1,147
50	Other Engine Equipment Manufacturing	9	375
51	Electronic Connector Manufacturing	3	375
52	Photographic and Photocopying Equipment Manufacturing	4	154

~ 3,000 130,000

12-3

Documenting the Importance of Volume and Density

- Technological innovation primarily happens in big cities—places with density, both population density and business density.
- Map 1 shows that the places with the highest concentrations of "high tech" businesses tend to be large U.S. cities.
- The Kansas counties of Douglas, Johnson, and Leavenworth show up on the map and should be thought of as successful regions of the dense Kansas City metropolitan area.
- Density stimulates innovation for two main reasons: "thick markets" and easy face-to-face interaction stimulate a high volume of experimentation. Innovation is a "numbers game." Volume matters.
- Overall, Kansas has a natural disadvantage with regard to the dynamics of volume and density. Kansas ranks among the top-10 states with small towns or cities isolated from major metropolitan areas.



12-4

Defining Technology-Based Economic Development as a Guide for Strategy

Productivity Enhancement

The National Science Foundation tracks research and development activity among three categories, as defined below (with 2006 overall funding percentages in parentheses):

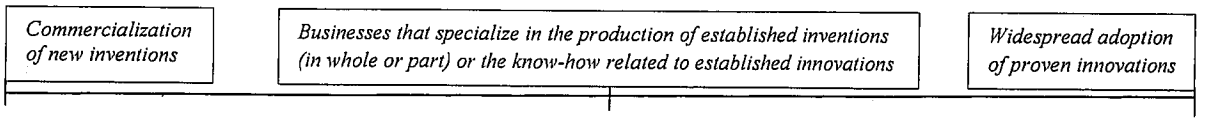
1. **Basic Research** (18%): The objective of basic research is to gain more comprehensive knowledge or understanding of the subject under study without specific applications in mind. Although basic research may not have specific applications as its goal, it can be directed in fields of present or potential interest. This is often the case with basic research performed by industry or mission-driven federal agencies.
2. **Applied Research** (22%): The objective of applied research is to gain knowledge or understanding to meet a specific, recognized need. In industry, applied research includes investigations to discover new scientific knowledge that has specific commercial objectives with respect to products, processes, or services.
3. **Development** (60%): Development is the systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes.

Table 2: Breakdown of Total R&D Activity, 1996-2006
(Inflation-Adjusted Dollar Amounts in Billions)

Performing Sector	*Funding Sector*				
	Industry	Fed Gov't	U&C	Non-Profits	Non-Federal
Basic Research ($518.8)					
Industry	14.5%	2.1%	0.0%	0.0%	0.0%
Federal Government	0.0%	8.4%	0.0%	0.0%	0.0%
Universities & Colleges	3.0%	**41.2%**	9.7%	3.6%	3.5%
Non-Profits	1.2%	6.1%	0.0%	5.6%	0.0%
Applied Research ($638.3)					
Industry	**59.2%**	7.8%	0.0%	0.0%	0.0%
Federal Government	0.0%	11.3%	0.0%	0.0%	0.0%
Universities & Colleges	1.0%	9.3%	3.0%	1.1%	1.1%
Non-Profits	0.5%	3.7%	0.0%	2.1%	0.0%
Development ($1,798.3)					
Industry	**80.5%**	9.3%	0.0%	0.0%	0.0%
Federal Government	0.0%	6.0%	0.0%	0.0%	0.0%
Universities & Colleges	0.1%	1.5%	0.2%	0.1%	0.1%
Non-Profits	0.1%	0.9%	0.0%	0.6%	0.0%

Note: R&D categories may not sum to 100% due to rounding errors.
Source: National Science Foundation

Figure 1: A Continuum of Technology-Based Economic Development



12-5

- The end goal of technology-based economic development is increased productivity among all sectors of the Kansas economy. That goal is most associated with the widespread adoption of proven innovations. Kansas can reap the benefits of innovation no matter where it arises. The fundamental criterion is that people choose to commit investment reseources on Kansas soil.

- Table 2 above helps demonstrate the allocation of resources dedicated to technology-based economic development in the U.S.

- The federal government dominates the area of basic research in partnership with universities and colleges.

- Once a technology shows promise, industry essentially takes over both the funding and the performance of the research.

- Note that the development stage—the stage most likely to produce economic results in terms of productivity growth—attracted 150% more monetary resources than the other two stages combined.

- A technology-based economic development strategy must acknowledge that most of the meaningful action for the Kansas economy is taking place among thousands of different businesseses with unique goals and operating requirements. Both strategy and policy must acknowedge the volume and complexity associated with the process.

- Commercialization of inventions is important for technology-based economic development and closely associated with university research, but it is a relatively small part, and the riskiest part. Kansas should have capability is all parts of the continuum in rough proportion to the end goal of generating broad-based productivity growth.

- For commercialization, The state government of Kansas can best augment the process by trying to attract a higher share of federal funds—especially funds allocated to universities. Currently, about 15 states account for 75% of the federal outlays for research and development.

- Research indicates that universities can help simulate the effects of density in small cities.

12-6

The Difficulty of Defining a Strategy—There are no Easy Answers

- The current state of economic research is unambiguous: no one has discovered the recipe for technology-based economic development in general or the creation of industrial "clusters" in particular. Scholars and practitioners know it when they see it but no one can articulate beforehand the correct approach.

- An irresolvable complexity punctuates the (usually decades-long) processes that result in successful technology-based economic development. Virtually all of the iconic U.S. "clusters" that people identify (and try to emulate) today—Hollywood, Silicon Valley, Route 128, Northern Virginia (biotech and internet), early 1900s Detroit (cars), early 1900s Wichita (aircraft)—looked equally as likely (or less likely) to succeed as many other places before they emerged as icons.

- "Entrepreneurship," one of the key elements of successful technology-based economic development, is equally as hard to implement. It is easy to say the word. But on one knows how to summon the magic—which itself appears to emerge as an ill-defined component of the complex development process. In the iconic clusters, the entrepreneurial magic can be traced back to one charismatic individual or a set of chance events.

- It is common for people to look at the places that have impressive activity related to technology-based economic development and try and copy the attributes, but acquiring the attributes may have no impact without the right market dynamics. The basic list of attributes are:

  (1) Adequate research and development funding
  (2) An adequate pool of educated and experienced human talent
  (3) Good educational institutions

  But these attributes usually produce little without (a) a competitive business environment and (b) people that are highly motivated to act entreprenurially.

- It is common for people to also list venture capital as a key attribute—one that will stimulate entrepreneurship. But the evidence clearly reveals that venture capital is a lagging indicator not a leading one. Plus, venture capital is a relatively small source of funding in most states. Evidence presented in the report shows that:

  - venure capital flows into Kansas when good business deals materialize.
  - venture capital flows into the state came from outside the state and Kansas City metro area.
  - venture capital flows to start-ups and young companies most readily when it also flows to mature businesses; indicating that the best approach to stimulating business creation is to create a profitable overall investment climate.
  - venture capital supplied by the state (via KTEC) reprsents, on average, less than 3% of funds received by start-ups and young companies.
  - venture capital supplied by the state (via KTEC) flowed to a trivial number of companies—less than 1% since 1995.

12-7

- Table 3 below provides a vivid example of how Kansas policy may not sufficiently address the volume issue.

- The industry sectors represented in Table 3 are those in which KTEC is known to have made at least one investment. KTEC invested in 62 out of 8,629.

- The active-investor approach works against volume. It is too labor and time intensive.

Table 3: Number of Business Starts in Same Industry Sectors as Companies Sponsored by KTEC, 1995-2006

Industry Name	Business Count
Poultry services	2
Food preparations, nec	8
Pharmaceutical preparations	22
Chemical preparations, nec	10
Ozone machines	1
Air purification equipment	4
Electronic circuits	9
Medical instruments and equipment, blood and bone work	3
Projectors, still or motion picture, silent or sound	1
Neon signs	6
Voice telephone communications	10
Online service providers	95
Wheels, motor vehicle	6
Computer software	35
Security control equipment and systems	10
Computer integrated systems design	214
Computer software development	129
Prepackaged software	337
Systems software development services	30
Systems integration services	14
Information retrieval services	36
Computer related services, nec	156
Business services, nec	5,590
Home health care services	281
Engineering services	339
Biotechnical research, commercial	5
Medical research, commercial	7
Research institute	16
Business consulting, nec	1,253
TOTAL (vs. 62 known KTEC Clients)	**8,629**

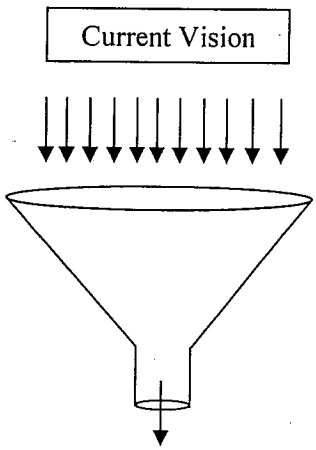
Note: KTEC had at least one investment in each category.
Source: National Establishment Time Series Database; Kansas Enterprise Technology Corporation; Center for Applied Economics, KU School of Business

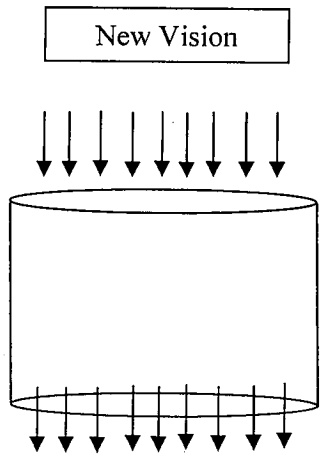
12-8

- A change in vision can help Kansas meet the large volume of activity in the state and help simulate the virtues of density.

- Simply stated, the state government of Kansas must abandon its prevailing policy vision of the State as an active investor in innovation and instead adopt the policy vision of the State as a caretaker of an innovation "platform"—a platform that motivates and enables a maximum amount of competition and experimentation with regard to innovation.

- By way of analogy, the platform-caretaker vision says: The State of Kansas runs tournaments; it does not field players. Creating a platform to host world-class tournaments will attract world-class players. The platform will endure but players will come and go. The platform-caretaker vision implies that the state government need not commit scare resources to the enormously difficult task of predicting the outcome of competition if it focuses on the much more manageable task of creating the platform on which competition takes place.





Current Vision:	**New Vision:**
• Dedicate considerable human and financial resources to the difficult task of predicting the "right" technologies or businesses. • Determine winners based on criteria like job count which is often at odds with the goal of (a) productivity-enhancing technological innovation and (b) birthing profitable new companies. • Reward winners with special privileges or resources.	• Dedicate human and financial resources to promoting volume and diversity—and the simulation of density. • Establish policies that treat all investments in innovation equally, thereby avoiding prediction in the face of uncertainty. • Focus state resources on important activities that the state can do best: supply the "public goods" parts of the technology-based economic development process.

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Measures of Success

1. Productivity = output per worker = higher wages
2. Capital investment (particularly in manufacturing)
3. Gross business starts
4. Federal research funds
5. Private industry R&D funding

Recommendations

- Volume and density are key themes in this report.
- The odds of successful technology-based economic development can increase if the Kansas legislature directs resources toward building an investment platform that expands the volume and diversity of experimentation in a way that motivates better adaption to the inherent complexity associated with technology-based economic development.
- The recommendations below seek to channel resources toward policies that promote and leverage volume and diversity. They focus on value-added roles related to technology-based economic development that the state government of Kansas can potentially execute better than any other organization.

Recommendation #1: Build world-class discovery platforms to simulate across the state of Kansas the "knowledge spillover," collaboration, and increased opportunity awareness that comes from urban density. Economic research clearly reveals that large cities promote innovation because the density associated with cities facilitates experimentation and knowledge spillover that comes with frequent face-to-face interaction. Kansas faces national disadvantages with regard to density, and few entities other than the state have an incentive to simulate the general economic benefits that result from density-driven knowledge spillover. The goal is easy to state: maximize the potential for Kansas businesspeople and scholars to communicate and interact with each other – and their peers from around the world – on a regular and consistent basis to motivate high-levels of regular face-to-face interaction as a means of cross-pollinating ideas related to innovation.

Recommendation #2: Link state research and development support more tightly to the acquisition of federal research and development funding and strive to increase the number of Kansas-based researchers competing for all manners of science- and engineering related federal funding. Federal funding dominates the areas of basic research and university-related applied research. Kansans could conceivably dedicate the entire GDP of Kansas to basic and applied research, with unpredictable results. The legislature has established clear statutory guidance about how to allocate limited funds toward technology-related research and account for the funding decisions. The state can work to expand the overall diversity of its research base by building broad-based grant programs to underwrite the process of Kansas scholars competing for all manner of federal grants. The goal is to substantially expand, without bias, the diversity and volume of basic and applied technology-related research. Economic research shows that universities can simulate the virtues of density in smaller-size cities, like those characteristic of much of Kansas.

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Recommendation #3: The state of Kansas should maximize the resources directed to building the research infrastructure and collaborative business environment related to technology-based economic development and minimize the resources directed to investments in individual business ventures. Only the state government has the incentive and ability to build a competitive business platform. Networks of businesspeople and scholars have a superior ability and incentive to manage a large – and highly distributed – volume of technology-related experimentation. State resources spent on building strong networks to match private investors with new or mature Kansas-based companies creates superior potential for handling volume and complexity. The evidence presented in this report indicates that the active-investor role played by the state has had, at best, a minor influence on technology-based economic development activity in Kansas. In exceptional cases, when the state may be the most appropriate organization to help underwrite the development of a technology, the question remains as to whether such development is better underwritten in the non-profit realm based on infrastructure-building grants instead of the for-profit realm based on some form of direct financial participation by state government in a private company. Companies and technologies come and go, but research infrastructure endures as a productive state asset.

Recommendation #4: Leverage the network of regional technology centers (business incubators) to help build more volume and more critical mass. The regional technology centers (business incubators) spread throughout Kansas (Great Bend, Hutchinson, Lawrence, Lenexa, Manhattan, Pittsburg, and Wichita) can play a strong facilitation role in the process related to Recommendation #1. Each of the KTEC-sponsored regional technology centers in Kansas has unique strengths. These strengths can help build volume by building better critical mass and better alignment of complementary skill sets. The dispersed physical locations can help connect people.

Business incubators play an important role in the technology-based economic development value chain. First, scientists or other inventors may have poor business training or acumen. Incubators that provide competent business and legal assistance help lower the cost of starting new enterprises and allow the individuals involved to focus on their relative strengths. Second, incubators can offer expert services that might not have commercial viability in the many thin markets of Kansas.

October 7, 2009 DRAFT

Technology-Based Economic Development in Kansas:

Issues, Opportunities, and Strategies

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KTEC
10/7-8/09
Attachment 13

Executive Summary

Enhanced prosperity through enhanced business-sector productivity defines a core goal of a technology-based economic development strategy. Productivity enhancement must take place on the frontlines of individual businesses through risky investments and a complex process of trial and error.

- Technology-based economic development represents a broad range of economic activities, from the commercialization of new inventions to the broad implementation of proven innovations. Every part of the broad range of activities contributes to the quest for greater productivity, so Kansas should seek a balanced approach that does not create a policy bias toward any particular activity.

- Industry funds and conducts most research and development activity in the U.S., except for basic research, which is primarily federally funded and conducted by universities and colleges.

- All technology-based economic development (and investment-driven economic development in general) has inherent risks. Diversification usually offers the most appropriate way of managing such risks. It makes economic sense for specific businesses to specialize. It makes much less economic sense for the state of Kansas to specialize based on economic predictions about the potential of any particular technology or business model.

- The odds of successful technology-based economic development can increase if the Kansas legislature directs resources toward building an investment platform that expands the volume and diversity of experimentation in a way that motivates better adaptation to the complex trial and error process associated with technology-based economic development.

- The state government of Kansas has the potential to execute better than any other organization three important parts of the technology-based economic development process. These parts represent the "public goods" components of the value chain, most of which occur at the early stages of the process: (1) basic research and certain types of applied research, (2) expanded networking and educational opportunities that create "knowledge spillover" and a greater awareness of business opportunity, and (3) value-added business incubation services that help lower the cost of business creation but that cannot survive unaided in the "thin" markets that characterize much of Kansas. The competent provision of each of these three items, combined with appropriate investment policies open to all businesses, can substantially increase the productivity of the state government's resources by promoting greater volume and diversity with regard to economic experimentation. Research supports the view that a diversity—rather than a specialization—of activities better promotes innovation.

The vision that informs Kansas policy must come to terms with the drivers of technology-based economic development: complexity fed by a high volume of experimentation that typically accompanies the dense populations and commercial activity characteristic of cities.

- Innovation and the growth of high-tech businesses occur primarily as an urban phenomenon. Innovation tends to happen in places characterized by a density of complementary types of

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commercial activity that can result in lower costs of production through better specialization and increased competition.

- Innovation feeds off density primarily because the trial and error required to implement new ideas happens more readily in places with abundant producers and consumers in combination with deep and broad pools of human talent.

- A vital—but hard to measure—virtue of density emerges from the ability of diverse groups of people to easily and frequently interact face-to-face. Face-to-face interaction plays an especially prominent role in the economics of innovation. It offers a superior way to communicate experienced-based, intuition-type knowledge characteristic of the innovation process.

- Volume and density matter with regard to innovation. In this respect, Kansas has a natural disadvantage. Kansas is one of the top-10 states in the nation with regard to the number of small cities that are not adjacent to a metropolitan area.

Kansas has hosted a relatively fast-growing number of businesses across a variety of technology areas and industries. The evidence supports the notion that most of this growth happened independently of any particular policy actions taken by the state of Kansas to explicitly promote technology-based economic development.

- As is characteristic of the nation, the growth in Kansas of "high-tech" businesses has occurred in the state's urban areas. Much of this growth occurred in a broad array of businesses that deal with technologies related to aerospace, communication, computer systems, and life sciences, particularly in the manufacturing elements of these technologies.

- Following the 1991 economic recession, Kansas has grown the number of "high-tech" businesses at a faster rate than either the nation or the Plains states.

- Most of the Kansas growth in high-tech businesses has occurred in the Kansas City area—specifically, the counties of Douglas, Johnson, and Leavenworth. Johnson County accounts for about 50 percent of the high-tech businesses in Kansas and about 30 percent of the high-tech jobs. Wichita (Sedgwick County) accounts for about 17 percent of the high-tech businesses and about 55 percent of the high-tech jobs (driven, in large measure, by the aircraft industry).

Volume and density are key themes in this report. The recommendations below seek to channel resources toward policies that promote and leverage volume and the virtues of density. They focus on value-added roles related to technology-based economic development that the state government of Kansas can potentially execute better than any other organization.

Recommendation #1: Build world-class discovery platforms to simulate across the state of Kansas the "knowledge spillover," collaboration, and increased opportunity awareness that comes from urban density. Economic research clearly reveals that large cities promote innovation because the density associated with cities facilitates experimentation and knowledge spillover that comes with frequent face-to-face interaction. Kansas faces national disadvantages with regard to density, and few entities other than the state have an incentive to simulate the general economic benefits that result from density-driven knowledge spillover. The goal is easy to state: maximize the

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potential for Kansas businesspeople and scholars to communicate and interact with each other – and their peers from around the world – on a regular and consistent basis to motivate high-levels of regular face-to-face interaction as a means of cross-pollinating ideas related to innovation.

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Business incubators play an important role in the technology-based economic development value chain. First, scientists or other inventors may have poor business training or acumen. Incubators that provide competent business and legal assistance help lower the cost of starting new enterprises and allow the individuals involved to focus on their relative strengths. Second, incubators can offer expert services that might not have commercial viability in the many thin markets of Kansas.

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Introduction

"Every culture and civilization has creation stories or myths about how the society started and took shape. These stories help define identity and order a chaotic, complex universe. Unfortunately, an appreciation of history and context is missing in the contemporary discussion of clusters. While increasingly clusters—regional concentrations of related firms and organizations—are perceived to be the locus of economic growth there is little understanding of how successful clusters come into existence. Moreover, little guidance is provided on the formation of clusters—both what policies to promote and, equally important, what policies to avoid. . . . Our understanding of industrial clusters needs to move beyond suggestions of a list of ingredients that, once in place, result in economic development. It is as if in the current conceptualization clusters emerge full grown, like Athena from the head of Zeus, without passage through defining developmental stages."

-- Maryann Feldman and Pontus Braunerjelm[1]

The notions of "technology-based economic development" and "clusters" have become virtually synonymous in the contemporary jargon of economic development practitioners. Yet both terms carry a variety of meanings among the many people that use them. Scholars and practitioners have coined the terms only recently. Yet the economic phenomena that the terms attempt to represent are almost ancient.[2]

The current state of economic research is unambiguous: no one has discovered the recipe for technology-based economic development in general or the creation of industrial "clusters" in particular. Scholars and practitioners know much about the ingredients and they can competently critique a particular recipe once the ingredients have had enough time to cook. But no one can articulate beforehand how to combine and cook the ingredients into an appetizing dish.[3]

An irresolvable complexity punctuates the (usually decades-long) processes that result in successful technology-based economic development. Virtually all of the iconic U.S. "clusters" that people identify (and try to emulate) today—Hollywood, Silicon Valley, Route 128, Northern Virginia (biotech and internet), early 1900s Detroit (cars), early 1900s Wichita (aircraft)—looked equally as likely (or less likely) to succeed as many other places before they emerged as icons.

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[1] "The Genesis of Industrial Clusters," in Pontus Braunerjelm and Maryann Feldman, eds., *Cluster Genesis: Technology-Based Industrial Development* (New York: Oxford University Press, 2007), p. 1.

[2] The term "cluster" entered the lexicon following Michael Porter's book, *The Competitive Advantage of Nations* (New York: The Free Press, 1990). For a discussion of the many applications of the term "cluster" in the scholarly literature, see: Adbelillah Hamouch, "Innovation Clusters and Networks: A Critical Review of the Recent Literature," 19th EAEPE Conference, November 2007. Alfred Marshall noted the empirical regularity of agglomeration (what he called "Industrial Districts") about 100 years earlier in his *Principles of Economics* (London: Macmillan, 1890).

[3] Pontus Braunerjelm and Maryann Feldman, eds., *Cluster Genesis: Technology-Based Industrial Development* (New York: Oxford University Press, 2007).

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The magic ingredient in the recipe of these authentic clusters carries the name "entrepreneurship." Policy makers, economic development practitioners, and scholars everywhere know how to summon the name. But they do not know how to summon the magic—which itself appears to emerge as an ill-defined component of the complex cooking process. In the iconic clusters, the entrepreneurial magic can be traced back to one charismatic individual or a set of chance events.

When people think of the term "technology-based economic development" they tend to attach it to modern labels like: "New Economy," "Information Economy," or "Knowledge-Based Economy." Yet, there has never been a time in history when the economy was not a "new economy." Nor has there ever been a time when the spread of knowledge via the communication infrastructure available at the time did not help propel economic progress. The modern-day labels represent scholars catching up with reality much more than a change in the reality that drives the economic development process.[4] The details of the development process evolve, but not the fundamental evolutionary dynamics.

State-based science and technology programs began to evolve in the 1960s and started to become integrated with economic development policies in the 1980s.[5] This evolution closely matches the evolution of economic research. In the 1950s, when economist Robert Solow first estimated economic growth equations, he found that he could statistically attribute only 12.5 percent of U.S. growth over the first half of the 20th century to the traditional components of labor and capital; he attributed the remaining (statistically unexplained) 87.5 percent to technological innovation.[6] It took until the 1980s before economist Paul Romer successfully built "knowledge" into the equations (even though economists understood the importance of knowledge many decades earlier).[7]

Innovation, Economic Development, and Economic Growth

Economic growth is defined as a sustained increase, over a period of time, in the material goods and services produced within a specified geographic region. This definition allows for two basic sources of growth: (1) the number of people that produce and (2) the efficiency with which the

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[4] For example, analysts working for the Organization for Economic Co-operation and Development coined the term "knowledge-based economy" in 1996. See: Benoît Godin, "The Knowledge-Based Economy: Conceptual Framework or Buzzword?" *Journal of Technology Transfer*, Vol. 31, 2006, pp. 20-21.

[5] Walter H. Plosila, "State Science- and Technology-Based Economic Development Policy: History, Trends and Developments, and Future Directions," *Economic Development Quarterly*, Vol. 18, No. 2, 2004, pp. 113-126.

[6] Robert M. Solow, "Technical Change and the Aggregate Production Function," *Review of Economics and Statistics*," Vol. 39, 1957, p. 320.

[7] See, for example, Paul M. Romer, "The Origins of Endogenous Growth," *Journal of Economic Perspectives*, Vol. 8, No. 1, 1994, pp. 3-22. For a much earlier statement on the central economic importance of knowledge, see F.A. Hayek, "The Use of Knowledge in Society," *American Economic Review*, Vol. 35, No. 4, 1945, pp. 519-530.

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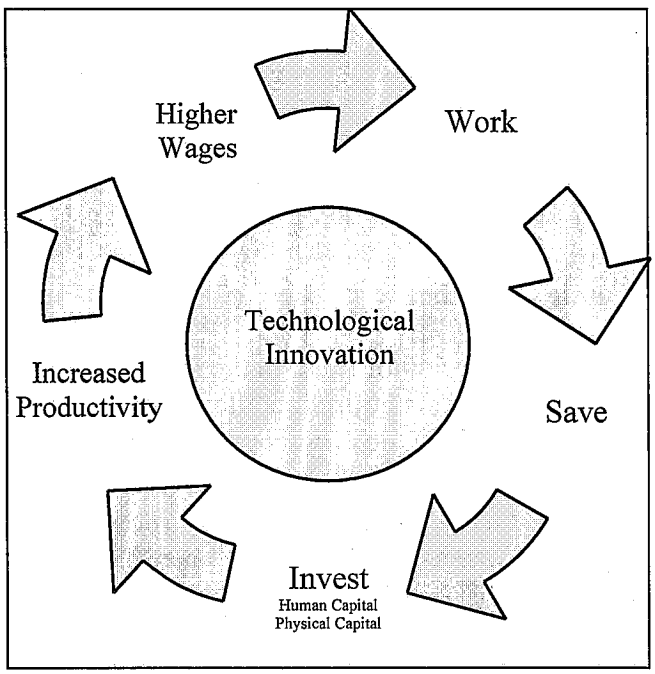
people produce over a given time period; that is, their labor productivity. The two elements can change at different rates.

The labor productivity component of economic growth drives labor compensation levels, and thereby the average standard of living within an economy. Businesses cannot, on a sustained basis, pay workers more than the value of what they produce. Therefore, compensation levels should closely track increases in the average monetary value of output per worker. For the state of Kansas, over at least the past three decades, the relationship between the dollar value of output per worker (productivity) and compensation per worker is nearly exact, having a statistical correlation of 98 percent.[8]

From the perspective of public policy analysis, people involved with the policy making process should distinguish between the terms "economic growth" and "economic development," because people mistakenly use the terms interchangeably. Economic growth has a concise, measurable definition. Economic development has a more amorphous meaning. Simply stated, economic development constitutes the many interrelated economic processes that culminate in economic growth—particularly the component of growth driven by improved labor productivity.

Figure 1: The Economic Growth Process



A process known as "capital deepening" defines the core aspect of economic development. Capital deepening simply refers to the capital intensity of the production processes within an economy. However, many complex economic phenomena underlie that simple meaning—phenomena associated with increasing rates of technological innovation and technological diffusion, increasing degrees of production specialization (including the manufacture of production capital itself), increasing organizational complexity, and increasing levels of relevant knowledge within the workforce. These phenomena must come together in a mutually reinforcing way on the front lines of individual businesses—usually through a risky process of trial and error—before economic development manifests itself as productivity-driven economic growth.

Figure 1 illustrates how technological innovation is central to the economic development process that generates productivity-driven economic growth. Technological innovation touches every part of the process. Indeed, the economic growth process can be thought of as a stepwise process

[8] Peter F. Orazem, "Slow Growth and the Kansas Productivity Puzzle," Policy Research Institute, University of Kansas, *Kansas Policy Review*, Vol. 26 (2), Fall 2004, p. 3.

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that takes place within the "fabric" of technological innovation. Economic development is the evolutionary process that diffuses technological innovations to all of the relevant parts of the economic system, which, as a practical matter, amounts to the front lines of individual businesses. Economist Robert Solow, as mentioned above, could attribute only a small share of U.S. economic growth to human capital (labor) and physical capital because technological innovation makes these two things increasingly better, makes their interaction increasingly better, and makes them more productive in the sense of producing more output with less input, thereby making each input more economically valuable.

A state economy experiences the economic growth process differently from the way a nation—and, increasingly, the way the world—experiences the process. In particular, an individual state is not nearly as constrained by the limits of the in-state saving-investment nexus and the in-state pipeline of technological innovation. A state economy can attract worldwide or nationwide savings to its soil in the form of investments—investments that have proven technological innovations embedded within them.

Defining Technology-Based Economic Development

Technology-based economic development has broad and narrow definitions. The broad definitions relate to the complex processes that drive productivity-driven economic growth. The narrow definitions relate to the commercialization of inventions that may jump-start new business enterprises. Broad-based prosperity results from broad-based productivity improvements. But the continuing process of broad-based productivity improvement requires a continual stream of new technologies, which often become the basis for new businesses.

An important distinction exists between invention and innovation. The terms do not apply interchangeably in the context of economic development.

The word "technology" applies to either devices or methods.[9] Technology is the representation or manifestation of knowledge in a devise, product, or process. Technologies can be distinguished (imperfectly) by the amount of embedded information. An invention is the creation of a new technology. An innovation represents an application of the invention as a product or production process. If the innovation proves successful, it will spread through a process known as technological diffusion.

The diffusion process—and therefore the productivity enhancements engendered by technological innovation—can take a substantial amount of time. Key parts of the process may have nothing to do with the innovation itself but with the entire array of economic interactions related to the innovation. For example:

[9] The discussion in this paragraph draws on Albert N. Link, "Entrepreneurship, Innovation, and Technological Change," Technical Report 07-0716, July 2007, Center for Applied Economics, University of Kansas, School of Business.

- Economist Robert Solow said in 1987, the same year he won the Nobel Prize in economics, that: "You can see the computer age everywhere but in the productivity statistics." However, by the late 1990s, the situation had changed. Measurement issues aside, research has shown that the productivity aspects of computer technology take a long time (about 5 to 7 years) to manifest themselves because their primary influence on productivity comes not from the devices but on how the devices allow for a gradual transformation of work processes.[10]
- Economist Paul David reports that it took about 40 years for the electric motor to substantially increase productivity. In the early years, the electric motor merely replaced steam engines. Major productivity advances came when engineers realized that the electric motor allowed for better factory designs.[11]
- It took about 35 years for the number of farm tractors to overtake the number of horses and mules used in farm production. They key issue had less to do with the improvement of the tractor and more to do with the relative cost of labor as people migrated from farm to city work.[12]
- More generally, technology researchers sometimes focus on a 10-90 principle in relation to technological diffusion—the time it takes for the diffusion (active use) of the technological innovation to move from 10 percent penetration to 90 percent penetration. Historically, hundreds of different technologies have registered 10-90 lags of 15 to 30 years.[13]

The long lag times associated with technological diffusion helps explain why much of the business contribution to research and development occurs in the latter stages of an invention's (or innovation's) life cycle. Much research and development involves something akin to continuous improvement of existing technologies. The National Science Foundation tracks research and development activity among three categories, as defined below (with 2006 overall funding percentages in parentheses):

1. **Basic Research** (18%): The objective of basic research is to gain more comprehensive knowledge or understanding of the subject under study without specific applications in mind. Although basic research may not have specific applications as its goal, it can be directed in fields of present or potential interest. This is often the case with basic research performed by industry or mission-driven federal agencies.
2. **Applied Research** (22%): The objective of applied research is to gain knowledge or understanding to meet a specific, recognized need. In industry, applied research includes

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[10] Erik Brynjolfsson and Lorin M. Hitt, "Computing Productivity: Firm-Level Evidence," *Review of Economics and Statistics*, Vol. 85, No. 4, 2003, pp. 793-808.

[11] Paul A. David, "The Dynamo and the Computer: An Historical Perspective on the Modern Productivity Paradox," *American Economic Review*, Vol. 80, No. 2, 1990, Papers and Proceedings of the Hundred and Second Annual Meeting of the American Economic Association, pp. 355-361

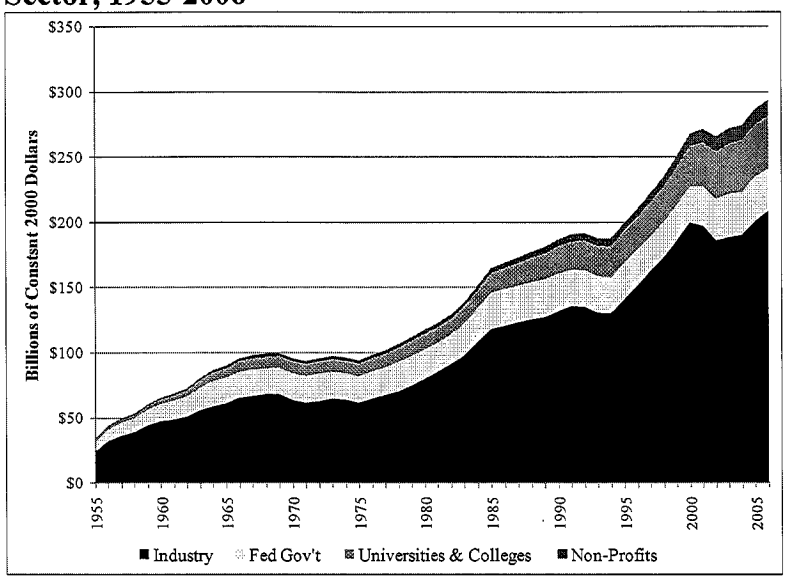
[12] Rodolfo E. Manuelli and Ananth Seshadri, "Frictionless Technology Diffusion: The Case of Tractors," National Bureau of Economic Research Working Paper 9604, April 2003.

[13] *Ibid.* See citations therein.

investigations to discover new scientific knowledge that has specific commercial objectives with respect to products, processes, or services.

3. **Development** (60%): Development is the systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes.

Chart 1: U.S. Research and Development by Performing Sector, 1955-2006



Source: National Science Foundation

Chart 1 illustrates the pattern of total research and development activity over the past 50 years. Industry's share has remained relatively consistent at about 70 percent. Universities and non-profits have approximately doubled their shares. The federal government's share has dropped by about 50 percent. To a large extent, the federal government has intentionally shifted research and development resources to universities and non-profits.

Table 1 provides a decade-long detailed breakdown regarding the sectors that perform and fund research and development, as organized by National Science Foundation definitions. The pattern is clear: the federal government, primarily in partnership with universities and colleges, dominates basic research. Industry essentially takes over once research and development reaches the applied stage. Industry performs almost 70 percent (and funds almost 60 percent) of the applied research; the federal government funds about one-third. Industry dominates both the performance and funding of research and development that has reached the development stage—the stage, which, over the past decade, has absorbed more than double the financial resources dedicated to basic and applied research combined—the stage most likely to have direct implications for productivity increases.

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Table 1: Breakdown of Total R&D Activity, 1996-2006
(Inflation-Adjusted Dollar Amounts in Billions)

Performing Sector	*Funding Sector*				
	Industry	Fed Gov't	U&C	Non-Profits	Non-Federal
Basic Research ($518.8)					
Industry	14.5%	2.1%	0.0%	0.0%	0.0%
Federal Government	0.0%	8.4%	0.0%	0.0%	0.0%
Universities & Colleges	3.0%	**41.2%**	9.7%	3.6%	3.5%
Non-Profits	1.2%	6.1%	0.0%	5.6%	0.0%
Applied Research ($638.3)					
Industry	**59.2%**	7.8%	0.0%	0.0%	0.0%
Federal Government	0.0%	11.3%	0.0%	0.0%	0.0%
Universities & Colleges	1.0%	9.3%	3.0%	1.1%	1.1%
Non-Profits	0.5%	3.7%	0.0%	2.1%	0.0%
Development ($1,798.3)					
Industry	**80.5%**	9.3%	0.0%	0.0%	0.0%
Federal Government	0.0%	6.0%	0.0%	0.0%	0.0%
Universities & Colleges	0.1%	1.5%	0.2%	0.1%	0.1%
Non-Profits	0.1%	0.9%	0.0%	0.6%	0.0%

Note: R&D categories may not sum to 100% due to rounding errors.
Source: National Science Foundation

When viewed from a system-wide perspective, like the national economy of the U.S. (and perhaps the economy of Kansas), the pattern of research and development activity reported in Table 1 helps define a value chain related to technology-based economic development. It fits three dominant research findings.[14] First, and most generally, research and development yield high rates of return for industry and society. Second, private returns to firm-financed research and development (especially in manufacturing) appear to yield much higher productivity-related returns than those achieved through government-financed research and development.[15] Third, non-profit making organizations—broadly defined—play a prominent role in successful innovation systems, primarily in the basic research part of the value chain.[16]

In the context of the U.S. innovation system, economist Jonathan West makes an apt argument: the more an economy relies on free market policies and institutions, the more important it is to have non-commercial organizations engaged in the production of basic research and education. Commercial organizations have too little incentive to engage in knowledge-creation activities that have no discernable pay-off.[17] Yet, the evidence clearly indicates that pioneering work in knowledge creation has long-run benefits related to prosperity and human well-being.

West's argument, combined with the long-evolving pattern of research and development activity reported in Table 1, can help define a technology-based economic development strategy for Kansas. A sound strategy must acknowledge that most of the productivity-enhancing activity

[14] For the first two findings, see Albert N. Link and Donald S. Siegel, *Innovation, Entrepreneurship, and Technological Change* (New York: Oxford University Press, 2007), Chapter 4.

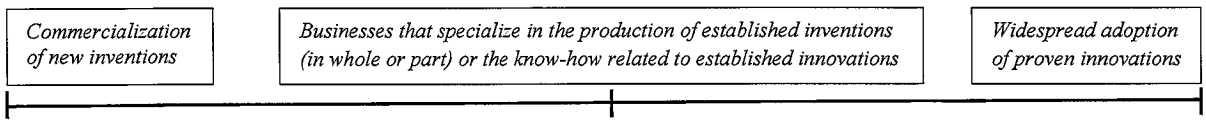
[15] Paul A. David, Bronwyn H. Hall, Andrew A. Toole, "Is Public R&D a Compliment or Substitute for Private R&D? A Review of the Econometric Evidence," *Research Policy*, Vol. 29, 2000, pp. 497-529.

[16] Jonathan West, "The Mystery of Innovation: Aligning the Triangle of Technology, Institutions and Organizations," *Australian Journal of Management*, Vol. 26, Special Issue, 2001, p. 29-30.

[17] *Ibid.*, pp. 30, 38.

takes place in the form of business investment during (and following) the development phase, as innovations become mature and diffuse broadly. However, the development phase also depends on adequate economic incentives related to the applied research phase and adequate infrastructure related to the basic research phase. The meaning of "adequate" in this context has no precise definition and inevitably must be an outcome of an ever-evolving policy discussion, especially since Kansas, unlike the world, need not necessarily rely on the early phases of the value chain to capture the productivity-enhancing elements of the latter stages of the value chain.

Figure 2: A Continuum of Technology-Based Economic Development



To help fix ideas, with the details of Table 1 in mind, technology-based economic development can form a three-point continuum, from the narrowest to the broadest definition, as illustrated in Figure 2. The broad nature of this continuum is consistent with the definition of technology-based economic development offered by the State Science and Technology Institute: ". . . an economy driven by technology . . . through the creation of new industries and the application of technology in traditional industries . . . an economic base composed of firms that constantly innovate and maximize the use of technology in the workplace."[18]

Enhanced prosperity through enhanced business-sector productivity defines the core goal of a technology-based economic development strategy. In any final analysis, making Kansas soil an attractive place for a broad array of people and businesses to commit their investment resources best advances this goal. Fostering innovation means fostering business experimentation. And, as a practical matter, business experimentation requires a commitment of resources—human resources, financial resources, and physical resources. The nature of the experimentation, and the resources required, differ among the three points on the continuum—and across the large variety of organizations implied by the continuum.

Commercialization of New Inventions

This node of the continuum in Figure 2 often occupies the attention of economic development practitioners that use the term technology-based economic development. It takes one of its most defined forms in the context of university "technology transfer" programs. According to the Association of University Technology Managers: "Technology transfer is a term used to describe a formal transfer of rights to use and commercialize new discoveries and innovations resulting from scientific research to another party. Universities typically transfer technology through protecting (using patents and copyrights), then licensing new innovations. The major steps in this process include the disclosure of innovations, patenting the innovation concurrent with

[18] http://www.ssti.org/TBED/intro.htm

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publication of scientific research and licensing the rights to innovations to industry for commercial development."[19]

Thomas A. Edison, the inventor credited with of the development of the light bulb, is referred to as the inventor of inventing because he brought a production mindset—a systemization—to the process of invention. This systems orientation animated his famous comment (1932): "Genius is one percent inspiration, ninety-nine percent perspiration." Edison's comment continues to explain the place of universities in modern discussions of technology-based economic development. Advanced science and engineering play a major role in the discovery—or continuous improvement—of many modern technologies. Universities offer a natural platform for the practice of advanced science and engineering.

Kansas can intelligently augment the substantial federal resources provided to universities for basic and applied research. Economic research indicates a strong connection between universities and small business-oriented research and development (although universities also assist technology development and diffusion among larger businesses). The development of new commercializable inventions tends be highly localized.

Economists Maryann Feldman and Maryellen Kelley conducted a set of case studies related to state-level programs and how "technology pioneering firms" accessed or used them. Three pertinent conclusions followed:[20] First, the authors' overall "findings suggest that perhaps the most important technology policy of state governments is their investments in the scientific and technical infrastructure of the universities within their jurisdictions." Second, the authors argued that states "should not rely exclusively on the generation of new firms as a policy for sustaining economic growth. Too few firms succeed, and even when they do, the state that spawns the new enterprise and contributes to its R&D capabilities may not benefit from the downstream employment generated by the production and application of the innovation." Third, the authors called "shortsighted" (even if politically understandable) the propensity of state governments to "evaluate the outcomes of their science and technology programs in terms of the gains in employment from the growth of companies within its jurisdiction."

Business that Specialize in the Production of Inventions or Know-How of Innovations

The causality among the discovery—innovation—commercialization nexus can run in multiple directions, and proceed in an iterative manner among many different entities. Table 1shows that in the basic research stage—and, to a lesser extent, in the applied research phase—industry participates with universities, the federal government, and non-profits in research and development process. The complex give-and-take of the process helps explain why the locality in which an innovation develops and becomes commercializable may not capture the economic value of the innovation. Once ideas reach a sufficient stage of maturity, they can rapidly spread

[19] http://www.autm.net/FAQs/2186.htm

[20] Maryann P. Feldman and Maryellen R. Kelley, "How States Augment the Capability of Technology-Pioneering Firms," *Growth and Change*, Vol. 33, No. 2, 2002, pp. 191-192.

across space. That is the nature of the diffusion process that drives productivity-enhancing technological progress.

Table 1 suggests that once the commercialization prospects of an idea become sufficiently clear, industry commits its own resources to the continuous improvement process. The execution of this process begins to define firms that meet the definition of "high-tech." According to the National Science Foundation, high-tech businesses are those "that employ workers who possess and in-depth knowledge of the theories and principles of science, engineering, and mathematics, which are generally acquired through postsecondary education in some field of technology. An industry is considered a high-technology industry if employment in technology-oriented occupations accounts for a proportion of that industry's total employment that is at least twice the 4.9% average for all industries (i.e., 9.8% or higher)." The National Science Foundation further delineates among three levels of high-tech. ***Level I*** high-technology industries include those in which technology-oriented employment is at least 5 times the average for all industries (or 24.7%). ***Level II*** high-technology industries include those in which the high-technology occupations are 3.0–4.9 times the average (or 14.8%–24.7% of total employment). ***Level III*** high-technology industries include those with a proportion of high-technology employment that is 2.0–2.9 times the industry average (or 9.8%–14.7% of total employment).[21]

Widespread Adoption of Proven Innovations

The development phase of research and development listed in Table 1 is not synonymous with widespread adoption of proven innovations. But the concentration of industry resources in this phase focuses attention of the nature of how innovations ultimately become engines of productivity growth—the ultimate goal of any worthy technology-based economic development strategy. Economist Richard Nelson has provided a broad definition of innovation: "the processes by which firms master and get into practices product designs and manufacturing systems that are new to them, if not to the universe or even the nation."[22]

This broad definition usefully deflects focus away from a common orientation of economic development practitioners related to the attraction or creation of individual businesses and their associated job count. Instead, it concentrates focus on the true driver of prosperity (and higher wages): productivity-enhancing investment. From the perspective of an individual state, creating the conditions and incentives for widespread adoption of proven innovations promises the greatest probability of long-run economic growth. Kansas, from an overall state perspective, seems to consistently lag in productivity growth.[23] The quest for conditions and incentives that

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[21] http://www.nsf.gov/statistics/seind08/c8/c8.cfm#s3

[22] Richard R. Nelson, ed., *National Innovation Systems: A Comparative Analysis* (New York: Oxford University Press, 1993), p. 4.

[23] Arthur P. Hall, "Economic Growth and Productivity in the Regions of Kansas, 1969-2003," *Kansas Policy Review*, Vol. 28, No. 1, 2006, pp. 12-20; and Arthur P. Hall and Dan Korber, "A History of Manufacturing in Kansas: Profile of an Economic Strength," Kansas, Inc. Research Report, December 2008.

promote broad-based productivity gains do not conflict with—and may well include—policies related to the earlier phases of basic research, applied research, and the initial commercialization of inventions.

Assessing Kansas Technology-Based Economic Development in a National Context

This report defines "high-tech" industries by collating the industry code definitions from four sources: (1) A report of "critical" technologies presented to the U.S. Congress by the U.S. Treasury Department, (2) a report published by the State Science and Technology Institute, (3) the American Electronics Association, and (4) the bioscience industries codified in the Kansas Economic Growth Act of 2004. Appendix A provides the entire list of industry codes and names, as well as data sources.

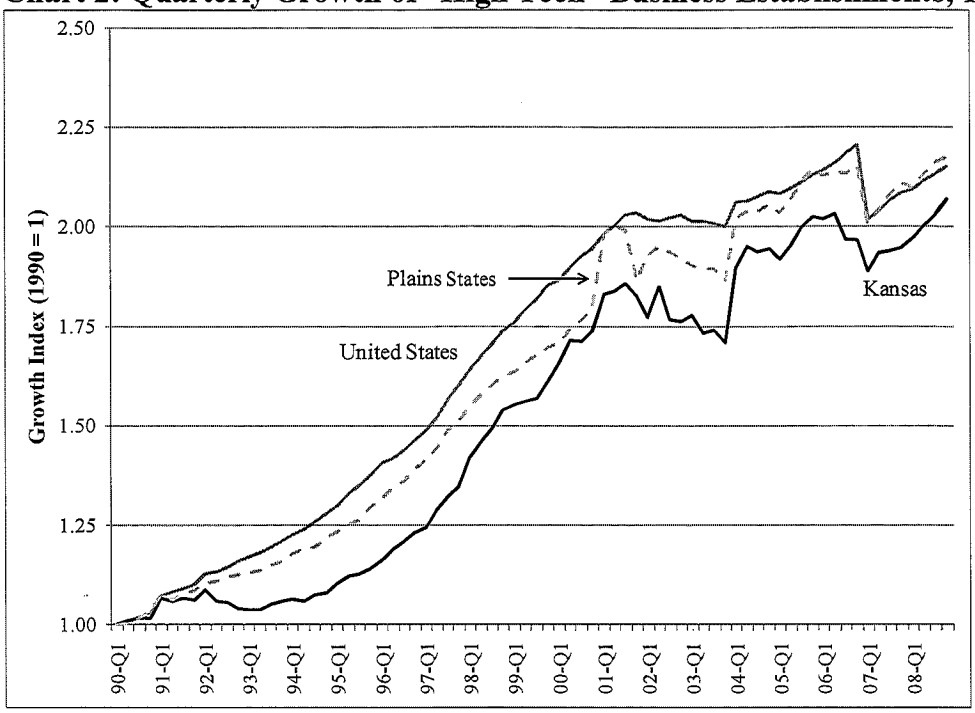
Kansas has experienced respectable growth in the number of "high-tech" businesses operating in the state. Chart 2 and Chart 3 report the growth rate of "high-tech" business establishments. Chart 2 offers a broad definition. Chart 3 offers a more narrow definition based on a subset of the most high-tech industry segments.

The general take-away from Chart 2 and Chart 3 is that Kansas has grown the number of high-tech businesses at a faster rate than either the nation or the Plains states, after accounting for the 1991 recession, which seems to have had a more lasting impact on Kansas. Referring to Chart 2, from Q1-1993 to Q1-2001, Kansas grew high-tech business establishments at an average annual rate of 7.4 percent; the rates for the U.S. and Plains states, respectively, were 6.8 percent and 7.2 percent. From Q1-2001 to Q4-2008, Kansas grew high-tech business establishments at an average annual rate of 1.53 percent; the U.S. 1.03 percent; and the Plains states 1.12 percent. The 2001 spike for the Plains states derived primarily from computer-services-related businesses in Minnesota and electric power distribution-related businesses in North Dakota.

The 2001 recession related to the terrorist attacks of 9-11 also had a greater impact on Kansas than the nation or the Plains states. A comparison of Chart 2 with Chart 3 shows that much of the negative impact derived from a temporary decline in businesses involved with aircraft-related manufacturing.

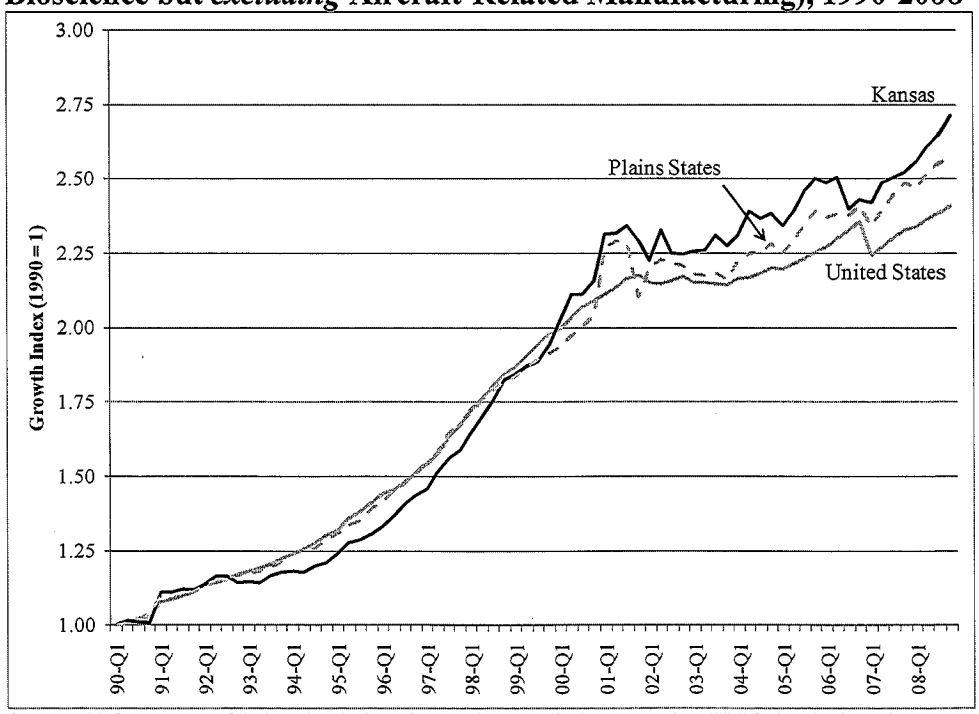
Most of the Kansas growth in high-tech businesses has occurred in the Kansas City area—specifically, the counties of Douglas, Johnson, and Leavenworth. Johnson County accounts for about 50 percent of the high-tech businesses in Kansas and about one-third of the high-tech jobs. Wichita (Sedgwick County) accounts for about 17 percent of the high-tech businesses and about 55 percent of the high-tech jobs. Not surprisingly, the aircraft industry (which ranks as a National Science Foundation Level I industry) drives the Wichita jobs statistic.

Chart 2: Quarterly Growth of "High Tech" Business Establishments, 1990-2008



Source: U.S. Bureau of Labor Statistics; Center for Applied Economics, KU School of Business

Chart 3: Quarterly Growth of *Select* "High Tech" Business Establishments (NSF Level I & Bioscience but *excluding* Aircraft-Related Manufacturing), 1990-2008



Source: U.S. Bureau of Labor Statistics; Center for Applied Economics, KU School of Business

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Table 2: Rank of Top Performing "High Tech" Industries in Kansas, 1990-2008			
Rank	**Industry Name (6-Digit NAICS Code)**	**2008 Business Count**	**2008 Estimated Job Count**
1	Cellular and Other Wireless Telecommunications	151	13,172
2	**Medical Laboratories**	119	11,475
3	Aircraft Engine and Engine Parts Manufacturing	13	4,914
4	All Other Motor Vehicle Parts Manufacturing	20	5,355
5	Custom Computer Programming Services	636	11,406
6	Drilling Oil and Gas Wells	102	5,590
7	Truck Trailer Manufacturing	13	3,893
8	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	9	2,266
9	Software Publishers	53	4,596
10	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables	12	1,412
11	**Pharmaceutical Preparation Manufacturing**	10	4,071
12	**All Other Basic Organic Chemical Manufacturing**	9	1,126
13	All Other Basic Inorganic Chemical Manufacturing	7	905
14	Computer Storage Device Manufacturing	4	1,203
15	All Other Miscellaneous General Purpose Machinery Manufacturing	16	1,288
16	**Research and Development in the Physical, Engineering, and Life Sciences**	90	2,562
17	Electronic Coil, Transformer, and Other Inductor Manufacturing	3	630
18	Other Measuring and Controlling Device Manufacturing	8	1,215
19	Motor Vehicle Body Manufacturing	20	2,714
20	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	16	437
21	**Biological Product (except Diagnostic) Manufacturing**	10	653
22	Computer Training	28	392
23	Fiber Optic Cable Manufacturing	1	375
24	Computer Facilities Management Services	30	995
25	**Ethyl Alcohol Manufacturing**	15	265
26	Internet Service Providers	31	251
27	**In-Vitro Diagnostic Substance Manufacturing**	2	749
28	**Surgical Appliance and Supplies Manufacturing**	28	1,495
29	Other Computer Related Services	56	1,406
30	**Laboratory Apparatus and Furniture Manufacturing**	4	175
31	**Pesticide and Other Agricultural Chemical Manufacturing**	4	175
32	Web Search Portals	6	176
33	Motor Vehicle Transmission and Power Train Parts Manufacturing	4	122
34	Totalizing Fluid Meter and Counting Device Manufacturing	5	170
35	Custom Compounding of Purchased Resins	5	63
36	**Nitrogenous Fertilizer Manufacturing**	4	176
37	Optical Instrument and Lens Manufacturing	4	55
38	Printed Circuit Assembly (Electronic Assembly) Manufacturing	6	77
39	Other Communications Equipment Manufacturing	6	149
40	Other Electric Power Generation	9	67
41	Other Pressed and Blown Glass and Glassware Manufacturing	5	60
42	Telephone Apparatus Manufacturing	13	588
43	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use	5	37
44	**Analytical Laboratory Instrument Manufacturing**	12	51
45	**Electromedical and Electrotherapeutic Apparatus Manufacturing**	16	37
46	Other Aircraft Parts and Auxiliary Equipment Manufacturing	120	19,233
47	Computer Systems Design Services	747	15,830

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Table 2 (Cont.): Rank of Top Performing "High Tech" Industries in Kansas, 1990-2008			
Rank	**Industry Name (6-Digit NAICS Code)**	**2008 Business Count**	**2008 Estimated Job Count**
48	Architectural Services	188	5,042
49	**Diagnostic Imaging Centers**	59	1,147
50	Other Engine Equipment Manufacturing	9	375
51	Electronic Connector Manufacturing	3	375
52	Photographic and Photocopying Equipment Manufacturing	4	154
53	Secondary Smelting and Alloying of Aluminum	3	60
54	Dental Equipment and Supplies Manufacturing	6	71
55	Carbon Black Manufacturing	1	60
56	Computer Terminal Manufacturing	5	57

Source: Bureau of Labor Statistics; Bureau of the Census; Center for Applied Economics, KU School of Business
Note: Includes only private sector firms with employees. Industry names in bold text indicate a bioscience designation per the Kansas Economic Growth Act of 2004.

Table 2 provides a ranking of high-tech industry sectors in which Kansas performs well compared to other states. It is not meant as an identification of Kansas "clusters," but rather a detailed list of the large and diverse volume of technology-related business activity in Kansas. The full list of industries in Table 2 represents about 50 percent of full list of high-tech industries reported in Appendix A. The rankings ratify what past analysis has indicated: Kansas is well positioned in technologies related to aerospace, communication, computer systems, and life sciences, particularly the manufacturing elements of these technologies.[24]

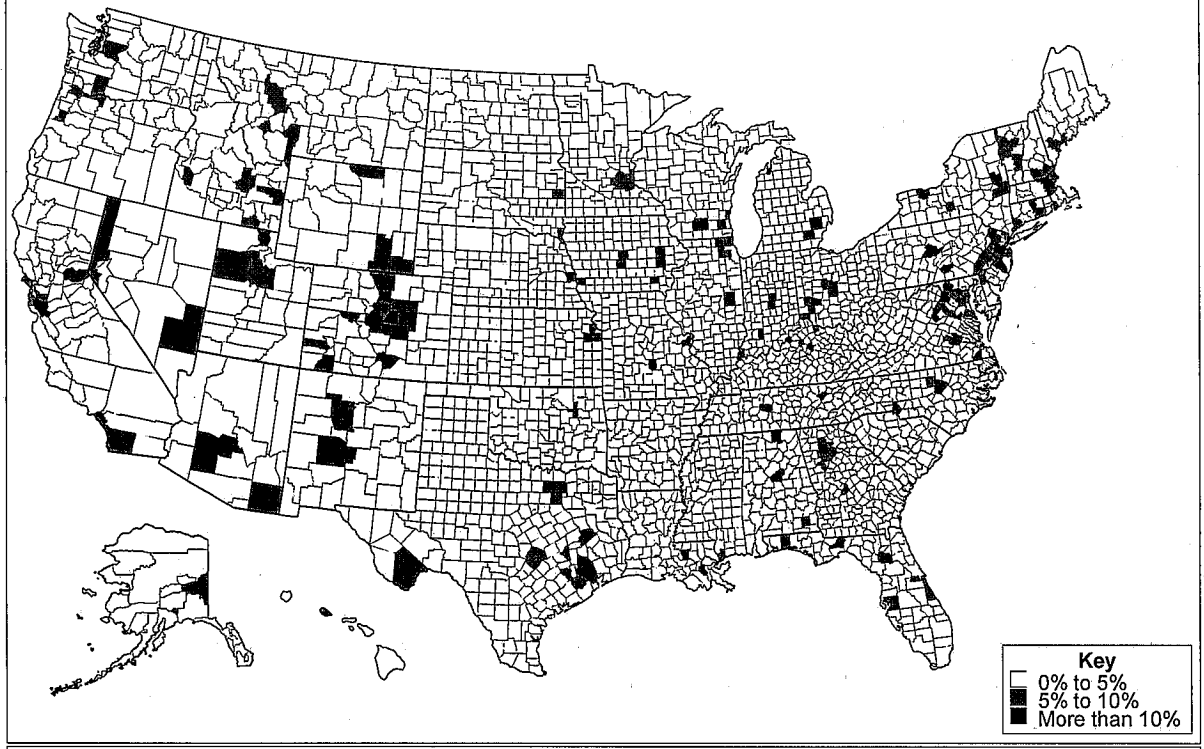
The rankings of performance in Table 2 resulted from a multipart test to determine in which sectors Kansas performed among the top-half of all states along several dimensions. The multipart test results were weighted by the share of each industry's overall share of Kansas jobs, thereby giving more weight to industries that employ more Kansans. The ranks also account for which industries grew faster from 2000 to 2008 than they did from 1990 to 2000, in order to gauge industry momentum. Table 2 provides the number of businesses and estimated employment levels in 2008, but employment levels play only a part in the rankings. Industry sectors that have lower employment numbers but higher rankings indicate they performed better with regard to the multipart growth test. (Appendix B provides details about the performance test.)

The Importance of Population Density for Technology-Based Economic Development

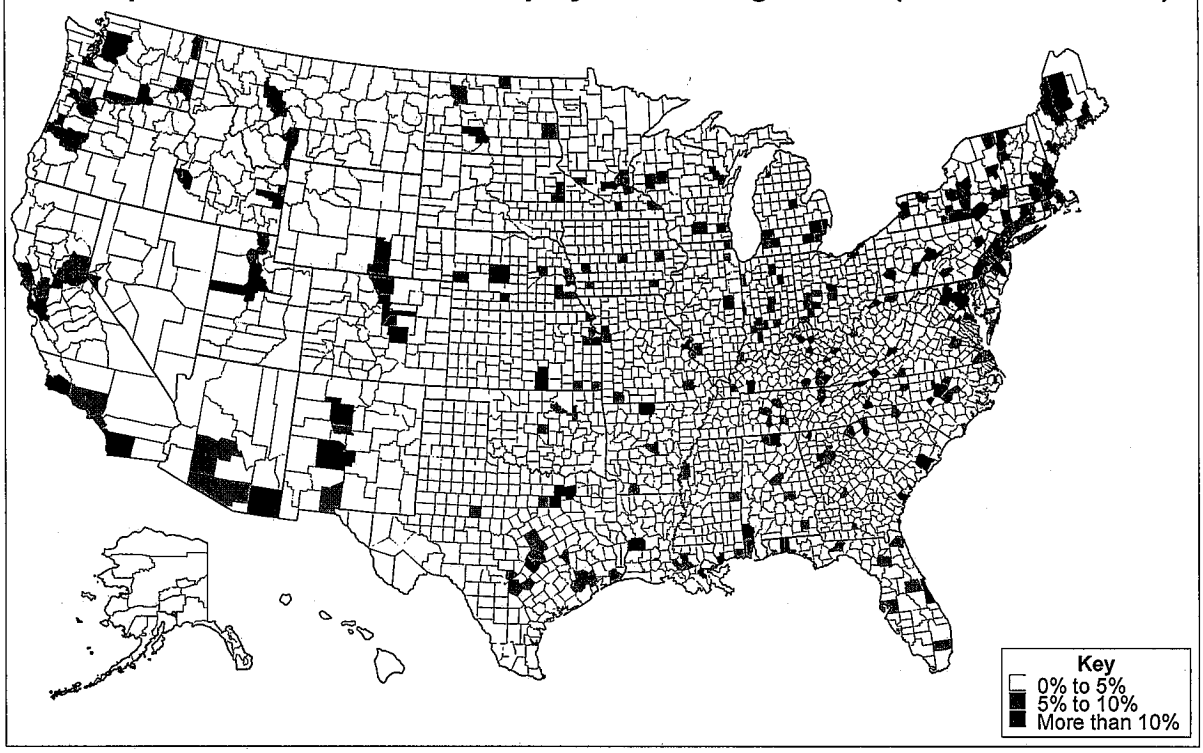
The urban areas of Kansas host most of the technology-related businesses in the state. Map 1 and Map 2 show that urban concentration of high-tech businesses is common nationwide: innovation and the growth of high-tech businesses occurs primarily as an urban phenomenon. Innovation tends to happen in places that have what economists call "agglomeration" economies—places characterized by a density of complementary types of commercial activity

[24] See, for example, Acumen Strategies, "A Strategic Technology Assessment for the State of Kansas," August 1995; and Kansas Technology Enterprise Corporation, "Kansas Strategic Technology Cluster Assessment and A Plan for the 21st Century," 2000.

Map 1: Share of Businesses that are "High-Tech" (NSF Level 1 + Bio)



Map 2: Share of Estimated Employment in "High-Tech" (NSF Level 1 + Bio)



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that can result in lower costs of production through better specialization and increased competition. (One can argue that cities result from agglomeration economics, but the process is symbiotic in that dense populations and business activity reinforce the agglomeration process.)

Innovation feeds off agglomeration primarily because the trial-and-error required to implement new ideas happens more readily in places with abundant producers and consumers in combination with deep and broad pools of human talent. A vital—but hard to measure—virtue of agglomeration emerges from the ability of diverse groups of people to easily and frequently interact face-to-face.

Face-to-face interaction plays an especially prominent role in the economics of innovation. It offers a superior way to communicate experienced-based, intuition-type knowledge known as "tacit knowledge." Tacit knowledge does not convey easily through written forms. When people must convey tacit knowledge to elicit new discoveries, develop new methods, or craft new techniques, close proximity and frequent face-to-face interaction reduces the cost and uncertainty associated with experimentation. Indeed, this fact helps account for a seeming paradox related to industrial "clusters": at the same time that the communication infrastructure has evolved to allow for rapid communication over long distances, the development and implementation of new knowledge has tended to become more localized.[25]

The importance of tacit knowledge in the innovation process has implications for the geography of innovation. Tacit knowledge comes from experience, so the pool of tacit knowledge in a place will depend, in part, on the economic activity that has a significant history in a place; the experienced-based knowledge of the people who have worked in particular industries. This idea helps underscore why the physical locations of "star scientists" explain the location of new, technology-based industries and why certain types of innovations have concentrations in particular regions. Empirical research shows that concentrations of biotech firms have grown in locations where key scientists resided at the time they made important discoveries.[26] Likewise, the geographic pattern of other industrial innovations closely matches the geographic concentrations of those industries—like fabricated metal in Ohio, pharmaceuticals in New Jersey, or plastic and synthetic materials in Texas.[27]

Map 1 reveals that high-tech industries generally have concentrations in the nation's largest cities. The map reports by county the share of all (private) business establishments represented

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[25] Michael E. Porter, "Clusters and the New Economics of Competition," *Harvard Business Review*, November 1998, pp. 77-90; Olav Sorenson and Toby E. Stuart, "Syndication Networks and the Spatial Distribution of Venture Capital Investments," *American Journal of Sociology*, Vol. 106, No. 6, 2001, pp. 1546-1588.

[26] Lynne G. Zucker, Michael R. Darby, and Marilynn B. Brewer, "Intellectual Human Capital and the Birth of U.S. Biotechnology Enterprises," *American Economic Review*, vol. 88, No. 1, 1998, pp. 290-306.

[27] Maryann P. Feldman and Richard Florida, "The Geographic Sources of Innovation: Technological Infrastructure and Product Innovation in the United States," *Annals of the Association of American Geographers*, Vol. 84, No. 2, 1994, pp. 210-229.

by the highest of high-tech business establishments—those involved in business that the National Science Foundation classifies as Level I (businesses that have technology-oriented employment at least five times the average for all industries) plus select bioscience industries identified in the Kansas Economic growth Act of 2004 not otherwise included. (See Appendix A for details.) A business establishment is defined as a place of business with a unique physical address. That definition includes everything from coffee shops to retail stores to manufacturing plants. For a major urban or suburban area to have concentrations of high-tech business establishments above 10 percent of total business establishments has economic significance.

Volume and density matter with regard to innovation. In this respect, Kansas has a natural disadvantage. Kansas is one of the top-10 states in the nation with population centers hosting 2,500-to-19,999 or 20,000-plus people that are not adjacent to a metropolitan areas.

Big ideas can emerge from anywhere. However, only a few states command the major share of research and development resources. According to the National Science Foundation, 10 states account for about two-thirds of research and development expenditures.[28] Those states figure prominently on Map 1 and Map 2: California, Michigan, New York, Texas, Massachusetts, Pennsylvania, New Jersey, Illinois, Washington, and Maryland.

Kansas accounts for about three-quarters of one percent of total research and development expenditures in the nation, and its research intensity (research and development expenditures divided by state gross domestic product) is less than half of the top states. Yet Map 1 and Map 2 show that the more dense population centers of Kansas have respectable presence in the top-tier high tech industries. Wichita is unique because it has an authentic, decades-old "cluster" in aerospace-related industries.[29] From an economic geography perspective, Douglas, Leavenworth, and Johnson counties, despite some unique attributes, are best thought of as successful regions of the Kansas City metropolitan area.

(Map 1 and Map 2 focus on what the National Science Foundation calls Level I high tech industries. Appendix A specifies the industries used herein. If Map 1 included all of the industries identified in Appendix A, more counties would meet the 5% to 10% criterion on Map 1. In Kansas, they would include Allen, Geary, Linn, Republic, Riley, Sedgwick, and Sumner.)

The Common Ingredients—but Elusive Recipe—for Technology-Based Economic Development

Table 3 provides a relatively straightforward approach for understanding the importance of density and volume for innovation. It reports the statistical correlation coefficients among several variables commonly used by researchers to evaluate a state's innovative potential. The closer the coefficient is to one, the stronger the correlation. Keeping in mind that a strong correlation does not necessarily imply a causal relationship, Table 1 shows convincingly that the

[28] See the tables and briefs at: http://www.nsf.gov/statistics/states/

[29] See Michael E. Porter, et al., "Wichita: Clusters of Innovation Initiative," Council on Competitiveness, October 2001.

absolute levels of these variables in a state have a strong correlation with one another. States with more absolute resources generate more innovation-related activity. By one estimate, it takes about 1,000 patents, on average, for a locality to generate one company that has a successful initial public offering.[30] Volume matters.

Table 3: Correlation of State-Level Research Variables Related to Innovation, Absolute Levels, 2000-2005

	Federal R&D Obligations	Industry R&D Spending	Academic R&D Spending	Venture Capital	Small Business Innovation Research Grants	Patents	GDP	Science & Engineering PhDs in Workforce
Federal R&D Obligations	1.00							
Industry R&D Spending	0.79	1.00						
Academic R&D Spending	0.85	0.87	1.00					
Venture Capital	0.84	0.92	0.82	1.00				
SBIR	0.88	0.85	0.83	0.91	1.00			
Patents	0.81	0.97	0.91	0.94	0.85	1.00		
GDP	0.76	0.87	0.95	0.79	0.75	0.92	1.00	
Science & Engineering PhDs in Workforce	0.88	0.91	0.98	0.87	0.88	0.94	0.95	1.00
Kansas Rank	42	24	32	35	35	33	31	34

Source: National Science Foundation; VentureXpert; U.S. Bureau of Economic Analysis; Center for Applied Economics, KU School of Business

Note, however, that although all of the variables in Table 3 have a strong correlation with the *level* of GDP (the size of the state economy), they each have a weak, negative correlation with the growth of GDP—both contemporaneously and over the subsequent four-year period. (Those coefficients do not appear in Table 3.) Similarly, economists Mary Riddel and Keith Schwer explicitly tested for a statistically significant causal relationship "between R&D and high-tech employment growth, including total R&D spending, university R&D spending, and federal R&D spending." They found none.[31]

[30] Joshua L. Rosenbloom, "The Geography of Innovation Commercialization in the United States During the 1990s," *Economic Development Quarterly*, Vol. 21, No. 1, February 2007, p. 13.

[31] Mary Riddel and R. Keith Schwer, "Regional Innovative Capacity with Endogenous Employment: Empirical Evidence from the U.S., p. 81.

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Table 4 modifies the message of Table 3 and suggests that, despite a possible absolute advantage offered by places with high density and volume, the possibility for establishing comparative advantage remains. When the variables of Table 3 are put into relative (instead of absolute) terms related to a state's GDP or civilian labor force, most of the strong statistical correlations disappear. Table 4 marks in bold text the stronger correlations that remain. Taken together, these correlations tell roughly the same story that much more sophisticated statistical research suggests: There is a fuzzy, but economically meaningful, relationship between academic research (predominantly funded by the federal government), industry research, technological innovation, and the commercialization of innovations. Further, economies that have evolved to support a strong contingent of highly educated scientists and engineers tend to be economies that have a high per-worker GDP—the metric most directly related to the definition of economic growth.

Table 4: Correlation of State-Level Research Variables Related to Innovation, Relative Levels, 2000-2005

	As a Share of State GDP				*As a Share of State Civilian Labor Force*			
Shares	Federal R&D Obligations	Industry R&D Spending	Academic R&D Spending	Venture Capital	Small Business Innovation Research Grants	Patents	GDP	Science & Engineering PhDs in Workforce
Federal R&D Obligations	1.00							
Industry R&D Spending	0.01	1.00						
Academic R&D Spending	**0.52**	0.10	1.00					
Venture Capital	0.20	**0.55**	0.25	1.00				
SBIR	**0.52**	**0.42**	**0.46**	**0.77**	1.00			
Patents	-0.02	**0.43**	-0.02	**0.59**	0.17	1.00		
GDP	0.42	0.04	-0.06	0.19	0.18	0.06	1.00	
Science & Engineering PhDs in Workforce	**0.66**	0.04	0.18	0.21	0.35	-0.02	**0.91**	1.00
Kansas Rank	43	18	31	33	37	33	34	36

Source: National Science Foundation; VentureXpert; U.S. Bureau of Economic Analysis; Center for Applied Economics, KU School of Business

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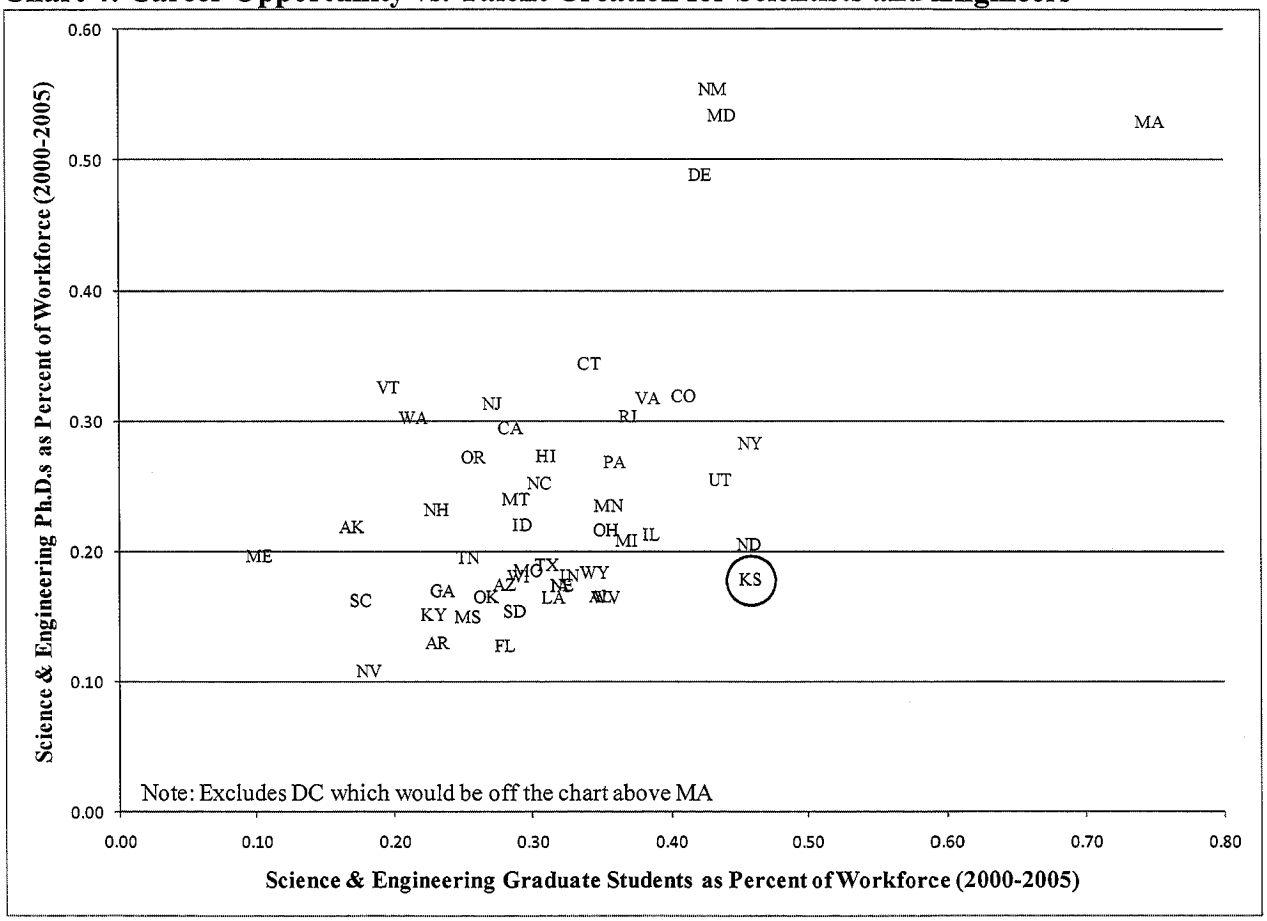
However, the pathway to achieving such an evolution remains elusive. States (or sub-state regions) can generate a substantial amount of activity related to the necessary parts of the innovation process yet fail to convert those parts into meaningful economic growth. In the words of David Audretsch and Maryann Feldman, two of the top scholars in the field of the economics of innovation: "While research has determined that geographic space matters for innovation, it has yet to unravel how agglomerations are formed, where they come from, how they are either sustained and strengthened, or else deteriorate over time."[32]

Chart 4: Career Opportunity vs. Talent Creation for Scientists and Engineers



Source: National Science Foundation

For example, Chart 4 shows that Kansas enrolls an above average number of science and engineering graduate students relative to its workforce (0.46 percent)—ranking second to Massachusetts (0.75 percent). But Kansas employs a below average number of science and engineering PhDs as a share of its workforce (0.18 percent)—ranking 35th among the states. Talented people move through Kansas universities but they apparently do not stay in Kansas.

[32] David B. Audretsch and Maryann P. Feldman, "Knowledge Spillovers and the Geography of Innovation," in J.V. Henderson and J-F Thisse, eds., *Handbook of Urban and Regional Economics, Vol. 4: Cities and Geography* (Amsterdam: Elsevier B.V., 2004), p. 2734.

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Research on population migration indicates that people have a strong preference for remaining in the state in which they graduate, especially if that state is also the state in which they were born. However, people with the highest degree of education have the highest propensity to make long-distance moves. Talented people and their ideas can move freely.[33] Providing high-tech education opportunities does not imply high-tech career opportunities.

Map 1 and Chart 4 demonstrates that Colorado—more specifically, Denver—provides a case in which density matters but the overall volume of research and development expenditures does not necessarily imply determinism with regard to the creation of a high-tech business sector. Colorado, as a share of its workforce, educates less science and engineering graduate students but employs many more than Kansas. Colorado's share of national research and development expenditure amounts to 1.75 percent, a little more than double the share for Kansas. But Colorado's level of research intensity (2.52%), though above the national average (2.34%), is well below the states with top rankings in this metric. The share in Kansas is below the national average (2.11%).

Colorado has the Rocky Mountains, a legendary life-style attribute often thought to attract people inclined toward innovation and high-tech work. However, man-made amenities can matter too. Fairfield Iowa (in Jefferson County)—a place that has natural amenities similar to Kansas—hosts the Maharishi University, which focuses on transcendental meditation. Map 1 indicates that it has achieved high tech success (in relative terms).

Innovative capacity generally depends on three attributes of a regional economy: (1) the overall volume of research and development funding, (2) the available labor pool (including related education and experience levels), and (3) educational institutions. But two business environment conditions must animate this capacity for successful technology-based economic development to happen. First, technological innovation seems to flourish in direct relationship to the intensity of the competitiveness of the business environment.[34] The interaction of many diverse types of knowledge that come together in novel combinations promotes innovation. Research shows that diversity across complementary activities that share a common science base generates more innovation than does specialization.[35] Second, the intense competition must manifest itself in a high level of deliberate interactions among the people within the region; that is, the presence of talented people and well-funded universities establish a necessary condition but perhaps not a

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[33] Arthur P. Hall, Scott Moody, and Wendy P. Warcholik, "The County-to-County Migration of Taxpayers and Their Incomes, 1995-2006, Technical Report 09-0306, March 2009, Center for Applied Economics, University of Kansas School of Business.

[34] See, for example, Mary Riddel and R. Keith Schwer, "Regional Innovative Capacity with Endogenous Employment: Empirical Evidence from the U.S.," *The Review of Regional Studies*, Vol. 33, No. 1, 2003, p. 79.

[35] Maryann P. Feldman and David B. Audretsch, "Innovation in Cities: Science-Based Diversity, Specialization and Localized Competition," *European Economic Review*, Vol. 43, 1999, pp. 409-429.

Universities Are Idea Drivers

Unfortunately, sometimes they're backseat drivers....

Universities are the places where ideas are created, though not all ideas are created equal. Some fall into the 'research for research sake' category, while others may have commercial application.

Universities should have aggressive efforts to evaluate research for commercial applicability and a process for protecting research with potential commercial application.

Universities should have policies in place that don't penalize researchers for working on commercial applications (versus tenure-track) and that ideally should reward researchers who are working on ideas with commercial application.

There should be mechanisms in place that connect researchers across universities – in some cases it's good to connect researchers that are working in common areas of interest (e.g. nanotechnology) to stimulate new applications or deepen understanding. Other times, unique opportunities present themselves when researchers from very different disciplines interact (applying engineering principles to cancer research).

Appendix C provides a sample of collaboration initiatives in other states.

sufficient condition for growth-promoting innovation.[36] Put another way, people in the talent pool must possess the motivation to act entrepreneurially.

Universities matter because they tend to support a research and development infrastructure. First, the overall stock of knowledge acts as a springboard for further knowledge. A cumulative impact emerges from knowledge generation. Second, small firms in particular seem to rely on universities for access to research and development inputs.[37] But universities can also foster technological diffusion throughout more mature industries. Perhaps most interestingly for Kansas, research suggests that universities can simulate for smaller cities the virtues of agglomeration found in big cities.[38]

Table 4 reports a much higher correlation between relative levels of industry research-and-development activity and patents (and very little correlation with university research and development). This result is consistent with more sophisticated research.[39] The measure of competitiveness in innovation activity offers one explanation for this finding. Industry resources tend to flow into research and development at the more mature stages of idea development. A higher share of research-and-development funded by the industry sector may indicate an environment more conducive to the expansion of research-and-development activity.[40] Kansas ranks well in industry funded research and development.

[36] Patrick Rondé and Caroline Hussler, "Innovations in Regions: What Does Really Matter?" *Research Policy*, Vol. 34, No. 8, October 2005, pp. 1150-1172.

[37] David B. Audretsch and Maryann P. Feldman, "Knowledge Spillovers and the Geography of Innovation," p. 2720.

[38] Harvey Goldstein and Joshua Drucker, "The Economic Development Impacts of Universities on Regions: Do Size and Distance Matter?" *Economic Development Quarterly*, Vol. 20, No. 1, 2006, p. 22-43.

[39] Mary Riddel and R. Keith Schwer, "Regional Innovative Capacity with Endogenous Employment: Empirical Evidence from the U.S., p. 78

[40] Scott Stern, Michael Porter, and Jeffery L. Furman, "The Determinants of National Innovative Capacity," National Bureau of Economic Research Working Paper 7876, September 2000.

Entrepreneurs help drive the innovation process. Map 1 shows high concentrations of high-tech activity around the Washington, D.C. region. Not long ago, no one could have convincingly predicted that this region would become a leader in Internet and bioscience technologies. But a sequence of events involving the downsizing of federal government agencies released the human talent in the region and motivated it to mobilize in new ways. The innovative capacity of the region mattered, but a set of unrelated events sparked the entrepreneurial drive of the local talent.

To a great extent, entrepreneurs emerge from the existing employment base of a region. Economist Maryann Feldman conducted a detailed investigation of the evolution of the innovation activity around Washington, D.C. and concluded that:

> The general lesson is that entrepreneurs adapt, and when they are successful, they build the types of resources that support their activities. A distinction should be drawn between the conditions that support innovation and the conditions that support entrepreneurship. The two concepts are certainly related: entrepreneurship is one way in which innovation is realized as firms are formed to commercialize and advance new ideas. External environments and resources may make it easier for innovation to be realized but may not be sufficient to induce new firm formation, which is where the concepts diverge.
>
> Once established, industrial clusters become virtuous, self-reinforcing circles. Yet, we know less about the conditions and factors—the initial spark or the entrepreneurial events—that influence the establishment of these clusters. Context, institutions and social relationships are certainly areas for public policy intervention in terms of creating a supportive and positive environment for entrepreneurship. Specifically relevant are the conditions that affect the decisions of individuals to become entrepreneurs, and the ways in which an entrepreneurial culture develops and takes hold. Much of the economic development discourse appears informed by attempts to replicate the characteristics associated with a fully functioning regional system in what may be considered a mechanistic economic development machine—line up the inputs and economic development will follow. Such a view ignores the rich context, diversity of experience, uniqueness and adaptivity of regional systems.[41]

Venture Capital in Kansas

Venture capital is one of the most common "inputs" that fall under Feldman's notion of mechanistic policy. Policy makers can easily establish taxpayer-funded pools of venture capital. Making those pools work effectively defines a far more difficult challenge. Research indicates

[41] Maryann P. Feldman, "The Entrepreneurial Event Revisited: Firm Formation in a Regional Context," *Industrial and Corporate Change*, Vol. 10, No. 4, 2001, p. 887.

that venture capital tends to operate as a lagging indicator (instead of a leading indicator) related to technology-based economic development.[42]

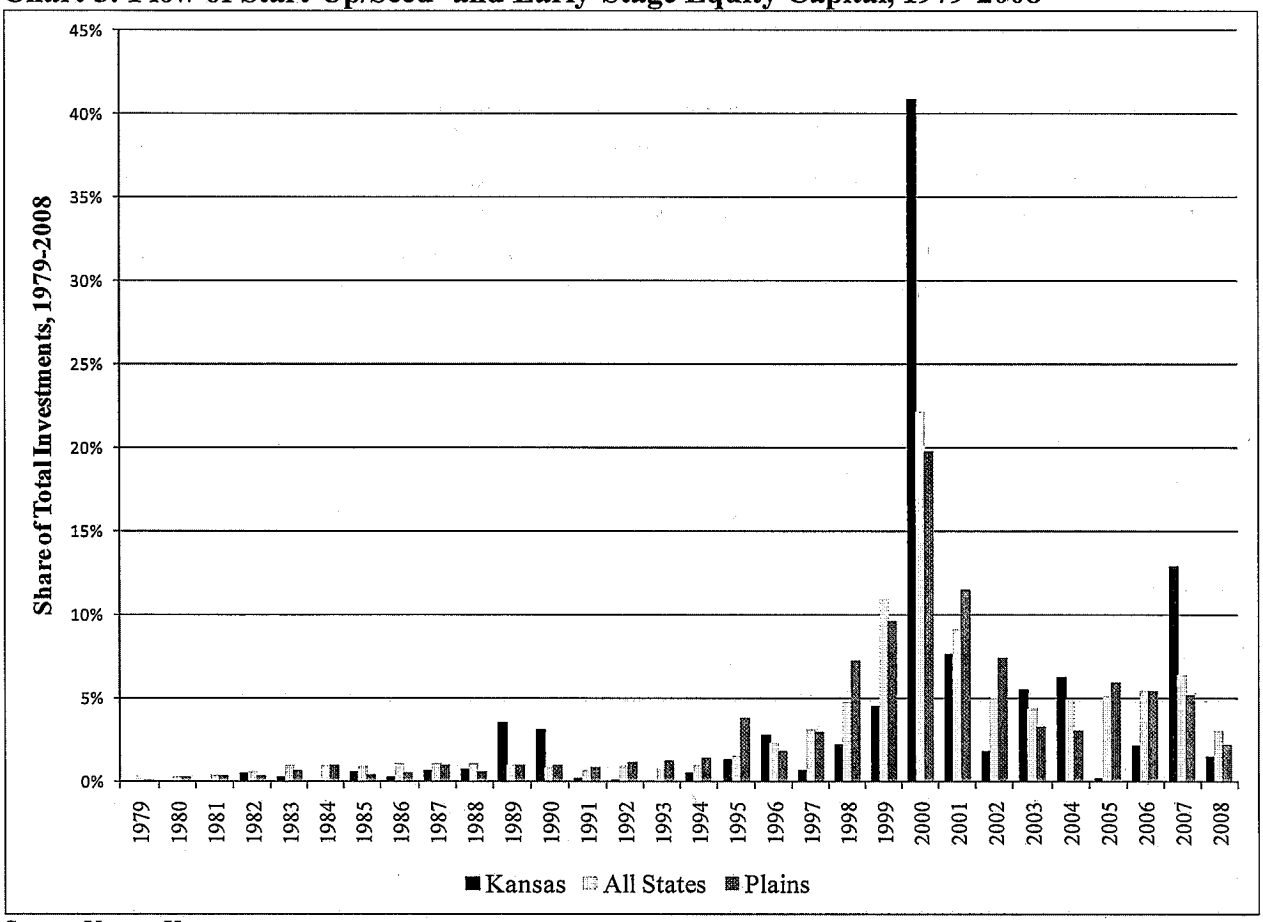
To a significant extent, this finding relates to the issues discussed above about the importance of local density. The high-risk elements of venture capital activity puts a premium on the trust and information flow related to frequent face-to-face contact. Naturally, the dollars associated with venture capital help enable entrepreneurs to execute their visions (although many other sources of funds exist). However, the true economic potency of venture capital activity arguably emerges from the mindshare of the experienced people engaged in—and committed to—a given venture.

Chart 5 illustrates for Kansas, the U.S., and the Plains states region, the flow of seed-stage plus early-stage equity investments over the past three decades, as informed by the VentureXpert database. Specifically, the chart reports the percentage in a given year of all so-defined equity capital investments over the three-decade time period. For example, in Kansas about 41 percent of the full sum of equity investments over three decades occurred in the year 2000, the height of the "dot-com bubble."

Chart 5 (and the information in Table 5 below) offers one important lesson: Kansas can attract private equity capital investment and the time pattern generally matches the time pattern of attractive investment opportunities. Kansas may not receive a large share of the nationwide flow of equity capital, but few states do. The allocation of venture capital is highly concentrated (as the densities implied by Map 1 suggests). Over the 1979-2008 time frame (per the VentureXpert database), California attracted about 44 percent of all equity investments; Massachusetts, second behind California, attracted about 11 percent; Texas attracted about six percent; New York about four percent; and Colorado about three percent. The entire Plains state region attracted about two percent of all equity investments, with Kansas measuring about three-quarters of one percent.

[42] Maryann Feldman and Pontus Braunerjelm, "The Genesis of Industrial Clusters," in Pontus Braunerjelm and Maryann Feldman, eds., *Cluster Genesis: Technology-Based Industrial Development* (New York: Oxford University Press, 2007), p. 12.

Chart 5: Flow of Start-Up/Seed- and Early-Stage Equity Capital, 1979-2008



Source: VentureXpert

For the U.S., Plains states, and Kansas, a remarkably strong statistical correlation exists between expansion-stage equity capital and seed-stage and early-stage capital. For the U.S., the correlation coefficients are 0.99 and 0.95, respectively. In Kansas, the correlation is stronger

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Table 5: Venture Capital Activity in Kansas by Venture Stage
(Dollars in Millions)

Years	1979 to 1985	1986 to 1990	1991 to 1995	1996 to 2000	2001 to 2008
Total Amount of Investment	$5.42	$35.35	$15.24	$345.72	$257.12
Start Up/Seed Stage	0	6.46	5.89	13.16	92.93
Early Stage	2.83	15.51	0.21	161.08	52.23
Later Stage	0	0.60	0	19.50	22.65
Expansions	2.59	12.79	9.14	151.98	89.31
Start Up/Seed Stage					
Number of Recipient KS Firms	2	3	4	6	15
Number of Investing Firms (excluding KTEC)	3	9	5	12	4-25
Number from outside KS or KC	3	9	5	11	3-25
Number of KTEC Investments	n.a.	n.a.	0	2	13
KTEC Share of Kansas Start Up/Seed Investments	n.a.	n.a.	0	3.8%	2.4%
Total Dollars Linked to KTEC Investment Recipients	n.a.	n.a.	0	$1.66	$82.62
Early Stage					
Number of Recipient KS Firms	5	2	1	11	10
Number of Investing Firms (excluding KTEC)	11	9	2	24-42	16-22
Number from outside KS or KC	11	9	2	22-40	13-21
Number of KTEC Investments	n.a.	n.a.	0	0	5
KTEC Share of Kansas Early Stage Investments	n.a.	n.a.	0	0	2.9%
Total Dollars Linked to KTEC Investment Recipients	n.a.	n.a.	0	0	$3.73
Later Stage					
Number of Recipient KS Firms	0	1	0	3	7
Number of Investing Firms (excluding KTEC)	0	2	0	5	12
Number from outside KS or KC	n.a.	2	0	5	6-12
Number of KTEC Investments	n.a.	n.a.	0	0	4
KTEC Share of Kansas Later Stage Investments	n.a.	n.a.	0	0	4.5%
Total Dollars Linked to KTEC Investment Recipients	n.a.	n.a.	0	0	$6.05
Expansion Stage					
Number of Recipient KS Firms	2	4	5	14	12
Number of Investing Firms (excluding KTEC)	2	13	7	32	10-21
Number from outside KS or KC	2	12	6	31	9-21
Number of KTEC Investments	n.a.	n.a.	0	0	5
KTEC Share of Kansas Expansion Investments	n.a.	n.a.	0	0	0.7%
Total Dollars Linked to KTEC Investment Recipients	n.a.	n.a.	0	0	$13.85

Source: VentureXpert; Kansas Technology Enterprise Corporation

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(internally) with expansion-stage capital and early-stage capital. Not surprisingly, Kansas and Plains states investment flows have a high correlation with U.S. flows. When investments look promising for the expansion of more mature businesses, they apparently look promising for investments in young companies too. This perspective suggests that Kansas may best foster the creation of new companies by focusing on the creation of a well-balanced investment platform for all companies.

Table 5 provides a detailed overview of the information about Kansas offered by the VentureXpert database. It segments the data by time period, life-cycle stage of the companies receiving equity investments, the number of companies receiving investments, the number of identifiable investing companies (which probably captures few, if any, angel investors), the location of investing companies, and data related specifically to the Kansas Technology Enterprise Corporation (KTEC) which operates a venture capital pool for the state government of Kansas.

The VentureXpert database does not capture all activity in Kansas. However, it captures enough Kansas-specific data to reveal some noteworthy points of analysis:

- Most of the companies engaging in equity investments reside outside of Kansas or the Kansas City metropolitan area.
- KTEC has participated in most of the recorded seed-stage and early-stage ventures between 2001 and 2008. It participated in fewer ventures from 1996 to 2000.
- The dollar amounts invested by KTEC represent a small share of total equity capital placements, regardless of the life-cycle stage of the recipient companies.

The small share of equity placements represented by KTEC investments raises a set of policy questions. First, is it the money or the legitimization that matters most? No doubt, a well-timed infusion of cash will help a young company; however, such an infusion need not necessarily come from KTEC. KTEC may play a legitimizing role. The due diligence and subsequent investment made by KTEC may provide a service and signal to other investors. If true, can KTEC (or some similar organization) fulfill its mission more cost-effectively by redirecting resources toward building better processes of due diligence and legitimization instead of directly participating in the risk of particular ventures? For example, if KTEC has a budget of $1 million, is that money better allocated to building venture capital networks or making direct venture investments in particular companies?

Table 6 provides one perspective on the last question. KTEC records indicate that from 1995 to 2008, it made 62 venture investments.[43] (Note that this number significantly exceeds the number reported by VentureXpert, as reported in Table 5.) The National Establishment Time Series database can identify most of the companies in which KTEC invested—and provides a code

[43] Thomas P. Miller and Associates, "Evaluation of the Kansas Technology Enterprise Corporation (KTEC)," Kansas Inc., April 2009, Appendix H.

number to identify the narrowly-defined industry in which each of the companies participated. Using that code, Table 6 reports that 8,629 companies started in Kansas within the same industry spaces from 1995 to 2006.

Table 6: Number of Business Starts in Same Industry Sectors as Companies Sponsored by KTEC, 1995-2006

Industry Name	Business Count
Poultry services	2
Food preparations, nec	8
Pharmaceutical preparations	22
Chemical preparations, nec	10
Ozone machines	1
Air purification equipment	4
Electronic circuits	9
Medical instruments and equipment, blood and bone work	3
Projectors, still or motion picture, silent or sound	1
Neon signs	6
Voice telephone communications	10
Online service providers	95
Wheels, motor vehicle	6
Computer software	35
Security control equipment and systems	10
Computer integrated systems design	214
Computer software development	129
Prepackaged software	337
Systems software development services	30
Systems integration services	14
Information retrieval services	36
Computer related services, nec	156
Business services, nec	5,590
Home health care services	281
Engineering services	339
Biotechnical research, commercial	5
Medical research, commercial	7
Research institute	16
Business consulting, nec	1,253
TOTAL (vs. 62 known KTEC Clients)	**8,629**

Note: KTEC had at least one investment in each category.
Source: National Establishment Time Series Database; Kansas Enterprise Technology Corporation; Center for Applied Economics, KU School of Business

The data available cannot speak to the question of whether all 8,629 companies matched the technology profile of those in which KTEC invested. Perhaps KTEC invested in companies much closer to the technology frontier—or perhaps not. The large number of companies suggests that hundreds, if not thousands, may have had similar technology profiles.

The more important policy point for Kansas relates to the magnitude of the difference reported in Table 6. Volume matters in the arena of technology-based development, as argued in detail above. Even if the small investment amounts—or the due diligence services—offered by KTEC have value, the labor intensity required for such activity cannot cost-effectively scale to the volume of economic activity taking place in Kansas.

A more dedicated approach to building investor networks offers a more promising approach. Networks scale easily to handle larger and larger volumes. Hands-on due diligence efforts do not scale easily.

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Networks are Important

Whether we call it 'technology-based' or 'knowledge-based' economic development, one of the most critical elements of successful regions and states is the presence of active, connected networks for entrepreneurs, technologists, researchers, and professionals.

Networks accomplish a number of things:

1. *Networks Lower the 'Cost of Failure'*
   - Trial and error is a critical process for all technologies to undergo and for products that result from them. 'Failure' is a critical part of the path to success: Thomas Edison unsuccessfully tried over 1,000 substances as potential filaments for his electric light bulb before finally settling on tungsten. Failure takes many forms for today's entrepreneurs: they may misjudge the market for their product, may underestimate the amount of funds needed to bring the product to market, they may miscalculate key features of the product, etc.
   - Entrepreneurs need the freedom to fail and unfortunately, most traditional, industrial cultures are intolerant of most forms of failure.
   - Networks allow entrepreneurs to surround themselves with other entrepreneurs who are following similar trajectories, allows them to learn vicariously from others' failures, and to brainstorm solutions and ideas in a supportive environment.

2. *Networks Shorten Timelines*
   As networks grow, they create opportunities for mentoring relationships to flourish. As new entrepreneurs begin to network with others who are farther along the timeline they learn shortcuts and can benefit from others' experience.

A network-building approach also offers more than just the potential to scale and distribute widely the due diligence process related to new ventures. First, it helps address problems of information asymmetry. It improves the odds that more people will know about worthy ventures. Second, a network-building approach simulates the economic benefits offered by density—the mindshare and trust built by frequent face-to-face interaction. A detailed examination of venture capital activity undertaken by scholars Olav Sorenson and Toby Stuart, and underwritten, in part, by the Kansas City-based Kauffman Foundation, reached this conclusion:

"Although the mass media and weak interpersonal ties routinely carry information across regional and community boundaries, we believe that the [venture capital] relation and other forms of exchange critical to the entrepreneurial process depend upon strong and embedded relations among the relevant actors. Because high uncertainty and significant information imbalances between market participants characterize this domain of activity, close and dense relationships among the relevant parties provide a critical catalyst to the process of mobilizing resources to build organizations.

"Whenever personal and professional networks play a central role in economic activity, we will likely observe spatial patterns in the unfolding of that activity. We have demonstrated the existence of these spatial patterns in the investments venture capitalists make. We have also shown that the evolution of interfirm relationships in the [venture capital] community appears to provide the mechanism for the erosion of geographic and industrial boundaries in the dispensation of a venture capitalist's funds. [Venture capital] firms with a history of provincial investment patterns and those without central positions in the industry's coinvestment network tend to invest locally; those who have established many and dispersed relationships with other [venture capital] firms invest across geographic and industrial spaces more frequently. More generally, we believe that institutions supported by broad participation among market incumbents must precede the expansion of the spatial range of exchange in markets that rely on private information or require a high degree of trust

3. *Networks 'Combust' New Ideas*
By bringing different technology platforms, expertise, markets and personalities together, ideas and concepts collide and begin to create new synergies and new product opportunities.

4. *Networks Attract Expertise to Ventures*
A challenge for many technology entrepreneurs is that while they are good 'technologists' they are often marginal business executives. Networks help connect experienced executives and technologists.

5. *Networks Generate 'Buzz'*
As network participants talk to other people in their personal networks, word begins to spread and a sense of 'something happening' begins to perpetuate even more network opportunities.

for transactions to occur. In venture capital, the industrywide coinvestment network provides this institutional infrastructure."[44]

Conclusions and Recommendations: Toward a New Strategic Vision

Technology-based economic development represents a broad range of economic activities from the commercialization of new inventions to the broad implementation of proven innovations. Productivity increases across all businesses defines the end goal of economic development—that complex process driving prosperity and overall increases in human well-being. From a worldwide perspective, continual productivity increases depend on a continual stream of inventions that become productivity-increasing innovations. But that truth does not necessarily follow from the more limited perspective of Kansas. Frequently, the gains from invention flow to someone other than the inventor.[45] And causality in the invention-innovation-diffusion process runs in multiple directions, not just one. Having a diverse base of mature businesses can manifest the "necessities" that become the mother of inventions that grow into innovations.

Kansas should seek a balanced approach across the full range of economic activities and avoid a policy bias toward particular segments of the technology-based economic development continuum. New ventures commercializing new inventions should not receive more favorable policy attention than mature businesses implementing proven innovations, and vice versa. All parts of the continuum contribute the evolutionary process of productivity-enhancing economic development.

Kansas has hosted a relatively fast-growing number of businesses across a variety of technology areas and industries. Most of this growth has occurred in the state's major population centers, a pattern representative of the nation. The evidence supports the notion that most of this growth happened independently of any particular policy actions taken by the state to explicitly promote technology-based economic development.

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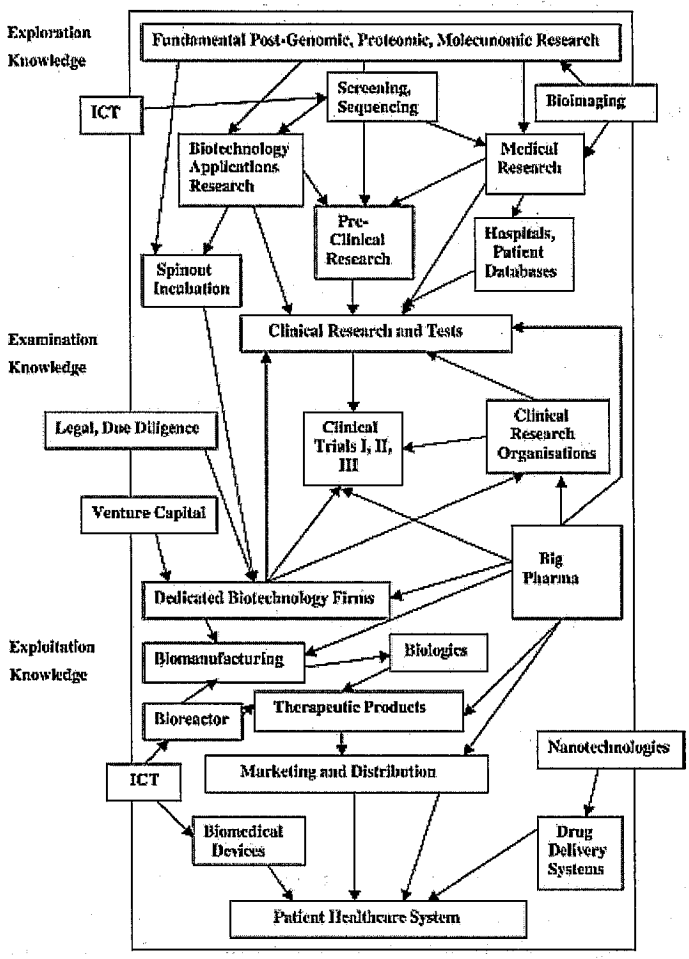
[44] Olav Sorenson and Toby E. Stuart, "Syndication Networks and the Spatial Distribution of Venture Capital Investments," *American Journal of Sociology*, Vol. 106, No. 6, 2001, p. 1584.

[45] John Kay, *Why Firms Succeed: Choosing Markets and Challenging Competitors to Add Value* (New York: Oxford University Press, 1995), Chapter 7.

That evidence does not imply irrelevance with regard to state policy. Technology-based economic development tends to thrive is cities—places characterized by "agglomeration," which means geographies with dense commercial activity and populations. Density promotes a high volume of experimentation through trial and error, which, in turn, promotes a co-evolution of mutually reinforcing economic activities based around experiments that succeed and lessons learned from experiments that fail. Authentic industrial "clusters" go one step further than agglomeration by evolving and institutionalizing social networks that reinforce experiment-driven co-evolution and learning.[46] State policy can either support or suppress this dynamically complex process.

Figure 3: A Biotechnology Value Chain



Source: Cooke, et al., "The Biosciences Knowledge Value Chain and Comparative Incubation Models," *Journal of Technology Transfer*, Vol. 31, 2006, p. 117

Figure 3 provides insight into the inherent complexity that defines technology-based economic development in general and authentic clusters in particular. It shows one conceptual model of a biotechnology value chain. In an authentic cluster, all of these elements would exist and work together in a cohesive manner. The cohesion would primarily have resulted from a long process of co-evolution based on experience that comes from many episodes of success and failure; in other words, adaption to complexity.

<u>A Vision that Embraces Rather than Fights Complexity</u>

The vision that informs Kansas policy must come to terms with the drivers of technology-based economic development: complexity fed by density (agglomeration) and volume (numerous experiments). When dealing with challenges that interface with complex adaptive systems—like generating productivity-enhancing economic development across the economically diverse regions of Kansas—indirect approaches frequently offer a higher probability of success than direct approaches.[47] A well-intended but pragmatically misguided policy vision channels

[46] Bo Carlsson, "Entrepreneurship and Public Policy in Emerging Clusters," Mimeo, p. 2.

[47] The noted British economist and business strategist John Kay has articulated this principle well: http://www.johnkay.com/business/317

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Kansas's economic development resources into a direct rather than an indirect approach. Consequently, most technology-based economic development policies in Kansas tend to fight against the inherent complexity of economic development instead of embracing and leveraging it.

Producing policies that embrace and leverage rather than fight against the complexity of the technology-based economic development process starts with a change in vision. Simply stated, the state government of Kansas must abandon its prevailing policy vision of the State as an active investor in innovation and instead adopt the policy vision of the State as a caretaker of an innovation "platform"—a platform that motivates and enables a maximum amount of competition and experimentation with regard to innovation. By way of analogy, the platform-caretaker vision says: The State of Kansas runs tournaments; it does not field players. Creating a platform to host world-class tournaments will attract world-class players. The platform will endure but players will come and go. The platform-caretaker vision implies that the state government need not commit scarce resources to the enormously difficult task of predicting the outcome of competition if it focuses on the much more manageable task of creating the platform on which competition takes place.

Replacing the prevailing direct approach represented by the active-investor vision with the indirect approach represented by the platform-caretaker vision will alter what it means for the state government of Kansas to "focus" its limited resources:

- "Focus" in the active-investor context requires state agencies to dedicate a considerable amount of human and financial resources to the difficult task of determining the "right" investments. The primary thrust of current Kansas technology-based economic development policy encourages or mandates state government agencies to act as a gatekeeper by essentially screening business deals the same way an active investor might. This vision of policy limits the state's potential in four basic ways. First, it does not scale; that is, it cannot handle the volume of economic activity that takes place in Kansas. Second, the active-investor approach gives rise to the perennial (and usually irresolvable) questions related to the state government's technology-based economic development "return on investment." Third, official notions of "return on investment" usually have an explicit jobs-count component, which directly conflicts with the end goals of (a) productivity-enhancing technological innovation and (b) birthing profitable new companies. Fourth, the active-investor approach runs the risk of causing genuine economic damage. Economic simulations suggest that policies that unintentionally target the "wrong" technologies can create negative economic feedback, not just a lack of positive economic feedback.[48]

- "Focus" in the platform-caretaker approach requires the state government to establish policies that promote a maximum amount of experimentation across the technology-based economic development continuum: new businesses, maturing businesses, and mature

[48] Mario A. Maggioni, "Mors Tua, Vita Mea? The Rise and Fall of Innovative Industrial Clusters," in Pontus Braunerjelm and Maryann Feldman, eds., *Cluster Genesis: Technology-Based Industrial Development* (New York: Oxford University Press, 2007), Chapter 11.

businesses. Most of the activity defined by the continuum—especially in the maturing-to-mature stages—takes place among tens of thousands of geographically dispersed organizations, all with unique goals and operating perspectives. No active-investor approach to policy can hope to intelligently handle the volume and complexity. However, few organizations other than the state government have an incentive to competently commit human and financial resources to certain parts of the innovation process. These parts represent the "public goods" components of the value chain, most of which occur at the early stages of the continuum: (1) basic research and certain types of applied research, (2) expanded networking and educational opportunities that create "knowledge spillover" and a greater awareness of business opportunity, and (3) value-added business incubation services that help lower the cost of business creation but that cannot survive unaided in the "thin" markets that characterize much of Kansas. The competent provision of each of these three items, combined with appropriate investment policies open to all businesses, defines the platform-caretaker vision, which can substantially increase the productivity of the state government's resources by promoting greater volume and diversity with regard to economic experimentation. Greater volume and diversity can increase the probability of successful technology-based economic development. Research supports the view that a diversity of activities—rather than a specialization of activities (as implied by the active-investor vision of policy)—better promotes innovation.[49]

Recommendations

The Kansas legislature over the past two decades has enacted many statutes and created several organizations to support or manage two basic activities: (a) the execution of research and development and (b) the cultivation of technology-oriented businesses, with an emphasis on start-up businesses. One general element of the legislature's statutory framework has the potential to limit rather than expand successful technology-based economic development. That element relates to the legislature's insistence that state funds be allocated based on analytical determinations related to the commercial viability and jobs-creating potential of specific technologies or innovations.

All technology-based economic development (and investment-driven economic development in general) has inherent risks. Diversification usually offers the most appropriate way of managing such risks. It makes economic sense for specific businesses to specialize. It makes much less economic sense for the state of Kansas to specialize based on economic predictions that absorb a substantial amount of costly time and talent.

The odds of successful technology-based economic development can increase if the Kansas legislature directs resources toward building an investment platform that expands the volume and diversity of experimentation in a way that motivates better adaption to the inherent complexity associated with technology-based economic development. The recommendations below seek to channel resources toward policies that promote and leverage volume and diversity. They focus

[49] Maryann P. Feldman and David B. Audretsch, "Innovation in Cities: Science-Based Diversity, Specialization, and Localized Competition," *European Economic Review*, Vol. 43, 1999, pp. 409-429.

on value-added roles related to technology-based economic development that the state government of Kansas can potentially execute better than any other organization.

Recommendation #1: Build world-class discovery platforms to simulate across the state of Kansas the "knowledge spillover," collaboration, and increased opportunity awareness that comes from urban density.

Economic research clearly reveals that agglomeration promotes innovation because the density associated with agglomeration facilitates experimentation and "knowledge spillover" that comes with frequent face-to-face interaction. Kansas faces natural disadvantages with regard to density. Knowledge spillover constitutes a form of "public good" important to the innovation value chain.

Few entities other than the state government of Kansas have an incentive to try and simulate the general economic benefits that result from density-driven knowledge spillover via the frequent face-to-face interaction of diverse groups of people. Vibrant regions of technology-based economic development have well-formed institutional mechanisms to facilitate the cross-pollination of ideas and broadly educate people about potential opportunities. This type of activity cannot easily reach a useful critical mass in the many scattered towns and small cities of Kansas as readily as it can in dense urban centers (except for Johnson County and, to a lesser extent, Wichita).

Defining a remedy for such a hard-to-define soft issue creates a challenge. The goal is easy to state: maximize the potential for Kansas businesspeople and scholars to communicate and interact with each other—and their peers from around the world—on a regular and consistent basis so as to motivate high levels of regular face-to-face interaction as a means of cross-pollinating ideas related to innovation. One approach might be to create a series of three or four major events annually dedicated to discovery that have a programmatic quality high enough to eventually supersede (and integrate) the technology- and association-related meetings or conferences that periodically occur throughout Kansas.

Size, consistency, diversity, and quality drive the potential of this type of activity. The imagery suggested by this recommendation would combine the vision the Kansas Technology Enterprise Corporation has for its Pipeline program with the scale and quality associated with a major technology association like Life Science Alley near Minneapolis, Minnesota.

KTEC bills its Pipeline program as "the nation's premier state-sponsored technology entrepreneur fellowship program." To date, the Pipeline program has focused on a small number of individuals each session—less than a dozen. The same quality of program should strive to reach many dozens and eventually hundreds of individuals throughout the state of Kansas. Only the state government has the resources and incentive to accomplish such a goal.

Life Science Alley claims that it "works successfully to forge connections among top industry experts so that remarkable new discoveries and advances can be made." It offers its members a consistent menu of high quality educational programs and networking opportunities. Promotional literature for Life Science Alley's 8th annual conference says: "Based on past

history, this year's conference is expected to draw more than 1,500 attendees from over two dozen states and a dozen countries." That is the type of scale the Kansas discovery platforms should strive to reach on a consistent basis.

With time and consistency, the volume of interactions created by world-class discovery platforms has the potential to generate the same virtuous outcomes for technology-based economic development that occur in dense urban areas.

Recommendation #2: Link state research and development support more tightly to the acquisition of federal research and development funding and strive to increase the number of Kansas-based researchers competing for all manner science- and engineering-related federal funding.

Kansans could conceivably dedicate the entire GDP of Kansas to basic and applied research, with unpredictable results. The state legislature has established clear statutory guidance about how to allocate limited funds toward technology-related research and account for the funding decisions. All funding recipients must raise matching funds.

The federal government dominates the funding of basic research and university-oriented applied research. The state of Kansas can work to expand the overall diversity of its research base by building a broad-based (competitive but open-ended) grant programs to underwrite the process of Kansas scholars competing for all manner of federal grants. Often, large grant-making organizations will offer pre-grant grants to facilitate a high-quality, competitive grant-making process related to a major project. Kansas research grants could be thought of as pre-grant grants for competing for federal grants. Kansas handicaps itself with regard to technology-based economic development by not attempting to leverage as much federal research and development funding as possible—from lab equipment for community colleges to federal agency grants for cutting edge science to major federal research organizations like the National Bio and Agro-Defense Facility (NBAF) scheduled for operation in Manhattan, Kansas.

Scholars that succeed in obtaining federal grants could be rewarded with a known amount of supplementary state resources. The state could also work to improve the odds of successful grant applications by committing the resources that would improve the odds of success from the perspective of federal grant-makers. Kansas has established many programs that operate in the same spirit as this recommendation. The goal is to substantially expand, without bias, the diversity and volume of basic and applied technology-related research.

An operational focus more tightly linking Kansas grant-making to federal grant-making offers several benefits. First, success defined as the successful acquisition of federal money is much easier to evaluate than success defined as state-funded research that led directly to a successful innovation. The indirect approach to technology-based economic development related to the platform-caretaker vision seeks to expand the overall volume and diversity of research by enhancing the overall capabilities of state universities and colleges. Second, and related, exposing more Kansas-based scholars to the cumbersome process of receiving and managing federal grants helps build personal (and institutional) expertise in one of the core features of the

U.S. innovation system. Technologies come and go, but university-related research and development infrastructure provides a durable platform for creating value at the front end of the innovation value chain. Universities tend to simulate agglomeration economics (density)—especially in smaller cities like those that characterize much of Kansas.[50]

Recommendation #3: The state of Kansas should maximize the resources directed to building the research infrastructure and collaborative business environment related to technology-based economic development and minimize the resource directed to investments in individual business ventures.

Every state government man-hour and dollar spent of on the screening of individual business ventures and actual investment in individual business ventures represent scare resources not spent building a more vibrant technology-based research and business platform to accommodate a greater volume and diversity of technology-related experimentation—the economic drivers of self-sustaining productivity-driven economic growth. Only the state government has the incentive and ability to build a competitive business platform. Networks of business people and scholars have a superior ability and incentive to manage a large—and highly distributed—volume of technology-related experimentation. State resources spent on building strong networks to match private investors with new or mature Kansas-based companies creates superior potential for handling volume and complexity. Improving investor networks also has superior potential to create a culture of entrepreneurship. Strategic relationships—and the mindshare they engender—play a fundamental role in such a culture.[51]

The evidence presented in this report indicates that the active-investor role played by the state government has had, at best, a minor influence on technology-based economic development activity in Kansas. Financial resources not spent directly by the state government can flow through the many indirect channels already established in law. Investment capital will flow into Kansas when promising business deals materialize. Furthermore, the success and popularity of the Angel Investor Tax Credit and the Regional Foundation Contribution Tax Credit illustrate that broad-based tax policies can motivate decentralized investment activity without undertaking the host of incentive problems associated with the state government behaving as an active investor in private companies. The Bioscience Tax Investment Incentive (K.S.A 74-99b52) and the Research and Development Tax Credit (K.S.A 79-32, 182b) also work to decentralize investment incentives. These two tax incentives programs, along with the Angel Investor Tax Credit, could be expanded and liberalized in lieu of having taxpayer funds directed toward the up-front financing of individual companies. (As a general economic policy matter, technology-related investments in mature businesses look identical to other forms of investment. Creating a favorable investment platform for all businesses offers the based way to also promote productivity-enhancing technology-based economic development.)

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[50] Goldstein and Drucker, "The Economic Development Impacts of Universities on Regions: Do Size and Distance Matter?"

[51] Toby E. Stuart and Olav Sorenson, "Strategic Networks and Entrepreneurial Ventures," *Strategic Entrepreneurship Journal*, Vol. 1, 2007, pp. 211-227.

Exceptions may exist. Many conceivable cases could present themselves in which the state government could become the investor of last resort. The general character of the cases would exhibit high levels of "technology risk," as oppose to "market risk" or "management risk." Experienced private financiers understand the latter two types of risk, and will tend to engage when the technology has passed a proof-of-concept test. Different technologies have different levels of technology risk. For example, a common thread of reasoning relies on an argument that potential investors can more easily resolve technology risks in the field of computers than they can in the field of the life sciences. As economist Jonathan West put the matter: "Most life sciences projects and life science start-ups come into being precisely to determine whether the concept will work technically. The underlying science is *not* well understood, and must be established through experimentation."[52] The question remains for the state government of Kansas, however, whether the technology risks can be better resolved in the non-profit realm based on infrastructure-building research grants instead of the for-profit realm based on some form of direct financial participation in a private company by the state government.

Recommendation #4: Leverage the network of regional technology centers (business incubators) to help build more volume and more critical mass.

The regional technology centers (business incubators) spread throughout Kansas (Great Bend, Hutchinson, Lawrence, Lenexa, Manhattan, Pittsburg, and Wichita) can play a strong facilitation role in the process related to Recommendation #1. Each of the KTEC-sponsored regional technology centers in Kansas has unique strengths. These strengths can help build volume by building better critical mass and better alignment of complementary skill sets. The dispersed physical locations can help connect people.

Business incubators play an important role in the technology-based economic development value chain. First, scientists or other inventors may have poor business training or acumen. Incubators that provide competent business and legal assistance help lower the cost of starting new enterprises and allow the individuals involved to focus on their relative strengths. Second, incubators can offer expert services that might not have commercial viability in the many thin markets of Kansas.

Some states have so-called "technology councils." They have certain features that may also assist with the quest for better volume and collaboration in connection with the regional technology centers. Appendix D describes a sample of technology councils that operate in other states.

[52] West, "The Mystery of Innovation," p. 35.

Appendix A

North American Industrial Classification Codes
Used to Define "High-Tech" Industries

Note: Industry names in bold text are bioscience per the Kansas Economic Growth Act of 2004. Industry names in italic meet the National Science Foundation definition of Level I Industries, meaning technology-oriented employment is at least five times the average for all industries.

6-Digit NAICS	Industry Name
213111	Drilling Oil and Gas Wells
221111	Hydroelectric Power Generation
221113	Nuclear Electric Power Generation
221119	Other Electric Power Generation
221121	Electric Bulk Power Transmission and Control
221122	Electric Power Distribution
325110	Petrochemical Manufacturing
325120	Industrial Gas Manufacturing
325131	Inorganic Dye and Pigment Manufacturing
325182	Carbon Black Manufacturing
325188	All Other Basic Inorganic Chemical Manufacturing
325192	Cyclic Crude and Intermediate Manufacturing
325193	**Ethyl Alcohol Manufacturing**
325199	***All Other Basic Organic Chemical Manufacturing***
325211	Plastics Material and Resin Manufacturing
325212	Synthetic Rubber Manufacturing
325311	***Nitrogenous Fertilizer Manufacturing***
325320	***Pesticide and Other Agricultural Chemical Manufacturing***
325411	***Medicinal and Botanical Manufacturing***
325412	***Pharmaceutical Preparation Manufacturing***
325413	***In-Vitro Diagnostic Substance Manufacturing***
325414	***Biological Product (except Diagnostic) Manufacturing***
325991	Custom Compounding of Purchased Resins
327112	Vitreous China, Fine Earthenware, and Other Pottery Product Manufacturing
327212	Other Pressed and Blown Glass and Glassware Manufacturing
331112	Electrometallurgical Ferroalloy Product Manufacturing
331314	Secondary Smelting and Alloying of Aluminum
333295	Semiconductor Machinery Manufacturing
333314	Optical Instrument and Lens Manufacturing
333315	Photographic and Photocopying Equipment Manufacturing
333511	Industrial Mold Manufacturing
333513	Machine Tool (Metal Forming Types) Manufacturing
333518	Other Metalworking Machinery Manufacturing
333618	Other Engine Equipment Manufacturing
333999	All Other Miscellaneous General Purpose Machinery Manufacturing
334111	*Electronic Computer Manufacturing*
334112	*Computer Storage Device Manufacturing*
334113	*Computer Terminal Manufacturing*
334119	*Other Computer Peripheral Equipment Manufacturing*
334210	*Telephone Apparatus Manufacturing*
334220	*Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing*
334290	*Other Communications Equipment Manufacturing*
334310	*Audio and Video Equipment Manufacturing*
6-Digit	Industry Name

NAICS	
334411	*Electron Tube Manufacturing*
334412	*Bare Printed Circuit Board Manufacturing*
334413	*Semiconductor and Related Device Manufacturing*
334414	*Electronic Capacitor Manufacturing*
334415	*Electronic Resistor Manufacturing*
334416	*Electronic Coil, Transformer, and Other Inductor Manufacturing*
334417	*Electronic Connector Manufacturing*
334418	*Printed Circuit Assembly (Electronic Assembly) Manufacturing*
334419	*Other Electronic Component Manufacturing*
334510	***Electromedical and Electrotherapeutic Apparatus Manufacturing***
334511	*Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing*
334512	*Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use*
334513	*Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables*
334514	*Totalizing Fluid Meter and Counting Device Manufacturing*
334515	*Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals*
334516	***Analytical Laboratory Instrument Manufacturing***
334517	***Irradiation Apparatus Manufacturing***
334519	*Other Measuring and Controlling Device Manufacturing*
335921	Fiber Optic Cable Manufacturing
336111	Automobile Manufacturing
336112	Light Truck and Utility Vehicle Manufacturing
336120	Heavy Duty Truck Manufacturing
336211	Motor Vehicle Body Manufacturing
336212	Truck Trailer Manufacturing
336214	Travel Trailer and Camper Manufacturing
336312	Gasoline Engine and Engine Parts Manufacturing
336322	Other Motor Vehicle Electrical and Electronic Equipment Manufacturing
336340	Motor Vehicle Brake System Manufacturing
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing
336399	All Other Motor Vehicle Parts Manufacturing
336411	*Aircraft Manufacturing*
336412	*Aircraft Engine and Engine Parts Manufacturing*
336413	*Other Aircraft Parts and Auxiliary Equipment Manufacturing*
336419	*Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing*
336611	Ship Building and Repairing
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing
339111	**Laboratory Apparatus and Furniture Manufacturing**
339112	**Surgical and Medical Instrument Manufacturing**
339113	**Surgical Appliance and Supplies Manufacturing**
339114	Dental Equipment and Supplies Manufacturing
339115	**Ophthalmic Goods Manufacturing**
488330	Navigational Services to Shipping
511210	*Software Publishers*
517110	Wired Telecommunications Carriers
517211	Paging
517212	Cellular and Other Wireless Telecommunications
517310	Telecommunications Resellers
517410	Satellite Telecommunications
517510	Cable and Other Program Distribution
517910	*Other Telecommunications*
518111	*Internet Service Providers*
518112	*Web Search Portals*
6-Digit	Industry Name

NAICS	
518210	*Data Processing, Hosting, and Related Services*
541310	*Architectural Services*
541330	*Engineering Services*
541370	*Surveying and Mapping (except Geophysical) Services*
541380	***Testing Laboratories***
541511	*Custom Computer Programming Services*
541512	*Computer Systems Design Services*
541513	*Computer Facilities Management Services*
541519	*Other Computer Related Services*
541710	***Research and Development in the Physical, Engineering, and Life Sciences***
541720	*Research and Development in the Social Sciences and Humanities*
541940	**Veterinary Services**
611420	Computer Training
621511	**Medical Laboratories**
621512	**Diagnostic Imaging Centers**

Sources:

- Report on U.S. Critical Technology Companies: Report to Congress on Foreign Acquisition of and Espionage Activities against U.S. Critical Technology Companies September 2007 (Declassified Version of 28 December 2006 Report) http://cip.gmu.edu/archive/ReportonU.S.CriticalTechnologyCompanies--FINAL.pdf

- Jerry Paytas and Dan Berglund, "Technology Industries and Occupations for NAICS Industry Data," State Science and Technology Institute, March 2004. http://www.ssti.org/Publications/Onlinepubs/NAICS_Tech1.pdf
- American Electronics Association's High-Tech Industry Definition: http://www.aeanet.org/Publications/IDMK_definition.asp

- Kansas Economic Growth Act of 2004 (HB 2647, 2004 Session)

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Appendix B
Description of the Test that Produced
the Rankings in Table 2

The test created eight categories for two different time periods: 1990-2000 and 2000-2008. Kansas received one point for a given industry sector for each successful category.

Category 1:

1. 50% or less of states showed positive growth in the number of establishments in the specified NAICS (Kansas included in those with positive growth)
2. 50% or less of states showed positive growth in the statewide share of private establishments in the specified NAICS (Kansas included in those with positive growth)
3. 50% or less of states showed positive growth in the number of estimated jobs in the specified NAICS (Kansas included in those with positive growth)
4. 50% or less of states showed positive growth in the statewide share of estimated private jobs in the specified NAICS (Kansas included in those with positive growth)

Category 2:

The Kansas growth rate ranked in the top-50% of the states showing positive growth in the following:

1. The number of establishments in the specified NAICS
2. The establishments in the specified NAICS as a share of all private establishments in state
3. The number of estimated jobs in the specified NAICS
4. The estimated jobs in the specified NAICS as a share of all private jobs in state

The scores for each time period were weighted by end-of-period employment share so that the score helped reflect the volume of economic activity reflected by a given NAICS.

A heavier weight was given to NAICS that had better employment-weighted scores for the 2000-2008 than for the 1990-2000 to provide an indicator of "momentum."

Appendix C

Samples of University-Business Collaboration Initiatives

Research Alliance of Missouri

The Research Alliance of Missouri (RAM) was formed in 2003 after a call by the Governor for a "new alliance between business and universities.... to coordinate research and provide more access to technology for Missouri businesses." At the request of the Governor, the Missouri Technology Council, whose charter calls for the establishment of a research alliance, and the Missouri Department of Economic Development convened the senior research officers from Missouri higher education institutions with active research and development programs. Since that time, the members of RAM have adopted a mission statement and have built new collaborative research initiatives among the institutions; initiated a process to streamline technology transfer from inventions in member university laboratories to commercial products; and assisted Missouri businesses in addressing technological problems through collaborative research projects.

Twelve universities are members of RAM: Central Missouri State University, University of Missouri-Kansas City, Northwest Missouri State University, University of Missouri-Rolla, University of Missouri-Columbia, University of Missouri-St. Louis, Saint Louis University, University of Missouri System, Southwest Missouri State University, Truman State University, Southeast Missouri State University, Washington University.

Utah Science, Technology and Research

In 2006, the Utah Legislature made a commitment to economic development and university collaboration by the approval of State Bill 75. This bill allocated $179 million to the Utah Science, Technology and Research (USTAR) Economic Development Initiative, $15 million in ongoing annual funding to support research teams at the University of Utah and Utah State University, $4 million to support economic outreach programs around the State, and $160 million toward the construction of new research facilities at the University of Utah and Utah State.

In 2007, USTAR funds were used to host a global nanotechnology conference in Utah and to introduce to world-class nanotech researchers who were recruited to the University of Utah with USTAR funds.

USTAR funds and focus has helped the University of Utah increase the number of spinout companies from 3 in FY 2005 to 20 in FY 2006 and 17 in FY 2007.

Access Technology Across Indiana

Access Technology Across Indiana (ATAIN) is a consortium of research institutions and organizations in Indiana promoting scientific advances and developments and facilitating their

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transfer to industry. ATAIN hosts statewide research conferences with the intent of bringing expertise together from different institutions to create research collaborations between universities and industry and across universities.

ATAIN recently launched the INDURE (Indiana Database for University Research Expertise) online database. INDURE is a searchable database that allows searchers to find specific research capabilities of faculty at Indiana's institutions of higher education. Unlike other databases, the INDURE database uses 'fuzzy logic' to allow a variety of search terms to be input into the system while still yielding valid results. The database also includes listings of sponsored research and intellectual property.

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Appendix D

Descriptions of a Sample of Public and Private Sector Technology Councils

States and state organizations can do a lot to foster technology-based economic development but engagement of the private sector is critical. There are two mechanisms that are prevalent in states and regions to engage experienced entrepreneurs, business executives and emerging technologists: technology councils, i.e. technology chambers of commerce, and Governor's technology or innovation councils.

A number of states have high-level technology advisory groups, usually convened by the Governor and occasionally staffed by the lieutenant governor. These councils are usually composed of successful entrepreneurs, world-class university and industry researchers.

In state cultures where traditional industries have dominated, governor's technology councils often help raise the visibility of innovation and technology-based industries and provide vital counsel about technology policies.

Many states have public sector-oriented technology councils; for example: Arizona, Colorado, Delaware, Massachusetts, Missouri, and Wisconsin. Many other states and regions have private sector-oriented technology councils. These councils look and operate similar to a chamber of commerce but focus almost exclusively on technology-based and/or high tech businesses and their issues.

One of the most important functions of technology councils, whether the public or private sector drives them, is their ability to create networks among entrepreneurs, researchers, policy-makers, and professionals. Vital and active networks are one of the most critical factors to creating and maintaining an entrepreneurial culture.

Public Sector Technology Councils

The Wisconsin Technology Council

The Wisconsin Tech Council is the science and technology advisor to the Governor and the Legislature. Launched in 2001, the Tech Council was created by a bipartisan act of the governor and the Legislature. It is an independent, non-profit and non-partisan board with members from tech companies, venture capital firms, all levels of education, research institutions, government and law.

The Tech Council has three main functions:

1) It provides policy guidance to lawmakers, the governor, state agencies and other institutions in Wisconsin. It has most notably done so through "Vision 2020: A Model Wisconsin Economy" and white papers that have served as background for policymakers.

2) It serves an important in-state networking role through Wisconsin Innovation Network (WIN), a community-based organization dedicated to fostering innovation and entrepreneurship. It also

works with other statewide and local affiliates. And it provides out-of-state networking through its "I-Q Corridor" activities and other events.

3) It serves as an economic catalyst through programs such as:

- Wisconsin Innovation Network (WIN), community-based organization dedicated to fostering innovation and entrepreneurship
- Wisconsin Entrepreneurs' Conference , A program focused on stimulating more entrepreneurial activity in Wisconsin across all segments of our economy.
- Wisconsin Early Stage Symposium, Open to technology companies seeking all capital.
- Monthly WIN Events Brings together entrepreneurs, business owners and related high tech professionals in a collaboration-rich environment.
- Governor's Business Plan Contest (BPC), An opportunity to compete for cash and in-kind prizes – but it is also a chance to get constructive feedback on your business plan and to help move it from "virtual business" to reality.
- Wisconsin Angel Network (WAN), WAN's mission is to build angel network capital capacity throughout Wisconsin in order to increase the number and amount of seed-stage equity investments in Wisconsin companies, creating jobs and improving our economy.
- Wisconsin Security Research Consortium, This consortium of research institutions in Wisconsin is dedicated to delivering world-class science and technology solutions in response to our nation's homeland security requirements.

The Massachusetts Technology Collaborative

The Massachusetts Technology Collaborative (MTC) is the state's development agency for renewable energy and the innovation economy, which is responsible for one-quarter of all jobs in the state. MTC administers the John Adams Innovation Institute and the Renewable Energy Trust. We work to stimulate economic activity in communities throughout the Commonwealth. MTC uses a collaborative approach to achieving the organization's mission. It brings together leaders from industry, academia, and government to advance technology-based solutions that lead to economic growth and a cleaner environment in Massachusetts.

John Adams Innovation Institute

The John Adams Innovation Institute is a division of the Massachusetts Technology Collaborative; the Innovation Institute is the Commonwealth's leading science, technology, and innovation policy agent, which fosters the vitality and capacity for self-renewal of the Massachusetts Innovation Economy.

Working closely with academics, industry practitioners and government officials, region by region and sector by sector, the Innovation Institute's mission is to enhance the capacity of the Massachusetts economy to sustain an ongoing flow of innovation, which is crucial to create, attract, and grow companies in emerging and established industries.

In order to achieve its goal, the Innovation Institute collaborates and invests with academic, research, business, government, and civic society organizations which share the vision of enhancing the Massachusetts Innovation Economy.

Target areas for partnership and investment include:

- Organizing for Innovation
- Innovation Capacity
- Statewide Innovation Initiatives
- Understanding the Massachusetts Innovation Economy

In its first four years of operation, the Innovation Institute collaborated with 835 organizations and invested $35.1 million through 63 investments, leveraging $181 million.

Arizona: Governor's Council on Innovation and Technology

The Governor's Council on Innovation and Technology (GCIT) was established in 2003 to act as a catalyst to develop new economic strategies. The Council provides a forum for ideas, as well as a framework, to enable Arizona to become a global leader in innovation and technology research, development and product creation.

The GCIT focuses primarily on improving Arizona's knowledge-based economy as a means to develop new economic development strategies.

- The Council's members include Arizona's most experienced and knowledgeable business and industry leaders.
- The Council's goals and objectives focus on areas that foster innovation, creation and entrepreneurial expansion of technology-based companies throughout the state of Arizona.
- The Council, in an effort to strengthen the innovation and technology infrastructure in Arizona, produced a series of recommendations in 2004.

The Governor's Council on Innovation and Technology develops and advocates for programs and policies that build a dynamic business environment and foster innovation, creation, and entrepreneurial expansion of technology-based companies throughout the state of Arizona. Goals and Objectives of the council include:

- Develop and periodically update a blueprint for technology-based economic development in Arizona through the creation of a long-term strategic plan.
- Stimulate technology transfer among and within higher education institutions and industry, including transfers of information available from federal agencies.
- Provide the framework, and a forum for ideas, to enable Arizona to become a global leader in innovation and technology research, product development and creation.
- Monitor changes in global economic conditions that may justify a re-orientation of Arizona's technology programs.
- Identify fields of science and technology that offer potential for application in Arizona.
- Contribute toward the improvement of the state's competitiveness in attracting new science and technology businesses.
- Create reasonable policies that attract and leverage private sector venture capital investment.

Colorado: Governor's Innovation Council

The Colorado Promise states that the Governor will call on leaders from industry, government, and academia to create a Governor's Council on Innovation and a Broadband Access Infrastructure Council to evaluate strategies for spurring broadband access.

Because innovation relates hand-in-hand with the broader quest to spur the development of broadband infrastructure throughout the state, the Broadband Infrastructure Task Force will be a Working Group within the structure of the Innovation Council. In particular, one important opportunity for the state is to use public sector communications needs as an anchor tenant for driving the rollout of broadband infrastructure and broadband-based applications (say, tele-

medicine) throughout the state. For public safety users in particular, a thoughtful strategy that places its communications needs in a larger context and marshals the use of state and local resources to invest in state-of-the-art networks promises considerable benefits, including addressing the interoperability shortcomings that manifested themselves in the aftermath of Columbine, 9/11, and Hurricane Katrina.

Missouri Technology Council

The Missouri Technology Council (MTC) was created by an act of the Missouri General Assembly in 1994. The MTC is incorporated as a private, not-for-profit organization led by a 15-member board of directors, 11 of whom are appointed by the Governor. The MTC is charged by law with being a focal point for creating better interface opportunities between Missouri businesses and universities to solve technical and productivity issues and for coordinating technology transfer opportunities. The MTC has since taken the initiative to create a 'strategic technology plan' for the state of Missouri.

Delaware Science and Technology Council

The Delaware Science and Technology Council was established in June 2006 by an executive order of Governor Ruth Ann Minner. The Council is charged with developing a statewide science and technology strategic plan and is designed to act as a convener for various science and technology advocates in the state.

The Delaware Science and Technology Council is staffed by the Office of Innovation and Partnerships at the University of Delaware and is chaired by the lieutenant governor.

Private Sector Technology Councils

CONNECT, San Diego, California

CONNECT may be one of the most successful models of a private-sector technology council that brings together the private sector and universities. CONNECT is a non-profit organization that was formed in 1985 to create and sustain innovative and technology-based companies in the San Diego area. Since its inception, CONNECT has assisted in the formation of over 2,000 companies.

In its most recent quarterly Innovation Report, CONNECT reports that in spite of the ongoing economic recession, 66 new technology companies were formed in the San Diego region during the first quarter of 2009, a 43% increase over the number created during Q1 in 2008.

CONNECT focuses on key objectives to help drive the San Diego regional innovation economy:

- Support for the areas research universities to help recruit and retain the best researchers and secure increased federal funding for research;
- Generate and protect intellectual property;
- National and international partnerships to increase the region's competitiveness;
- Fosters substantive interaction between academic and industry leaders;
- Secures and disseminates risk capital; and,
- Recruits talented entrepreneurs, researchers and scientists.

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CONNECT has an active public policy and advocacy program to monitor activity in Washington and Sacramento to assure that favorable public policy is enacted and that San Diego is well represented for federal research funding opportunities.

True to its name, CONNECT aggressively works to connect research institutions, venture capitalists, R&D departments of private companies, service providers, trade organizations, and defense contractors to accelerate technology transfer and commercialization of research. CONNECT has a large board of directors, 45 regular members with additional affiliate members. The board includes representatives from research and education institutions, professional services, industry, venture capital, affiliate members that represent chambers of commerce, foundations, and other organizations.

CONNECT reaches out to both first-time entrepreneurs and well as serial entrepreneurs through a variety of networking and recognition events. Their annual 'Oscar' event, the Most Innovative New Product Awards, is a black tie event that brings focus and recognition to the region's innovation culture. A lecture series, 'Frontiers in Science and Technology' showcases ground-breaking research in the region and the 'Entrepreneur Hall of Fame Awards' recognizes the area's entrepreneurial pioneers.

Connecticut Technology Council

The mission of the Connecticut Technology Council (CTC) is to build an interactive community of innovators and their supporters to create a thriving economy, job growth, a global reputation for entrepreneur support, and a lifestyle that attracts the best and the brightest people to Connecticut, and retain the young people who have grown up in the state.

The CTC has an annual 'Women of Technology' awards program designed to recognize and promote women in technology careers and has just launched a 'Girls of Technology' to encourage more girls to pursue STEM (Science, Technology, Engineering, Mathematics) classes in middle school.

CTC also has a unique focus on attracting and retaining entrepreneurial and technical talent and is working to identify competitive advantages (and disadvantages) that Connecticut has when attempting to attract and retain talent.

Utah Technology Council

The Utah Technology Council (UTC) has become the essential business resource for life science and high-tech companies seeking to achieve greater success. At its core, UTC exists to foster the growth of the state's 5,000 technology companies, ensure Utah develops the highest quality workforce in the nation, and attract an ever-increasing array of funding. Members join UTC to share insights with industry peers, counsel with government and academic leaders, and receive help from professional service providers and funding resources.

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Among its list of accomplishments, the UTC lists the Utah Fund of Funds, successful lobbying for the creation of the Utah Science, Technology and Research (USTAR) initiative, and it has focused on increasing Utah's educational requirements.

UTC hosts a variety of networking and educational events for members and sponsors the Annual Hall of Fame event to honor individuals with Utah ties who have made global contributions to the information technology and life science industries through new technology, innovation and leadership.

UTC hosts successful 'peer-to-peer' networking events to bring professionals from technology companies together for a brief presentation on a topic of interest, a group discussion, and networking. These events are normally 'members only' events, but UTC is experimenting with opening the events to the general public to increase awareness of the organization and to generate more 'buzz' about technology innovation.