Approved February 7, 1990
Date

MINUTES OF THE HOUSE COMMITTEE ON ECONOMIC DEVELOPMENT.

The meeting was called to order by Elizabeth Baker at
Chairperson

3:38 ~~a.m.~~/p.m. on Monday, January 29, 1990 in room 423-S of the Capitol.

All members were present except: Representatives Barkis, Reinhardt, Gjerstad, Gregory and Foster. Excused.

Committee staff present:
Jim Wilson, Revisor
Lynne Holt, Research
Elaine Johnson, Secretary

Conferees appearing before the committee: None

Chairperson Baker called the meeting to order at 3:38 p.m. and recognized Dr. William Brundage, President of Kansas Technology Enterprise Corporation.

Dr. Brundage briefed the committee on KTEC activities during the past year. Attachment 1. Dr. Brundage made reference to the "The Role of KTEC Programs in Kansas' Long-Term Economic Development," a report done by Dr. Anthony L. Redwood, Executive Director and Dr. Charles Krider, Director of Business Research at the Institute for Public Policy and Business Research, University of Kansas. Attachment 2. "KTEC - 1989 Annual Report" was distributed to the committee. A copy of this report is on file in the Legislative Research Department, Room 545-N.

Dr. Brundage responded to questions from the committee.

The meeting adjourned at 4:15 p.m.

Elizabeth Baker

Date: 1/29/90

GUEST REGISTER

HOUSE

Committee on Economic Development

NAME	ORGANIZATION	ADDRESS
Kevin M. Carr	KTEC	112 W 6
Marianne Hudson	KTEC	" "
Cindy Diehl	"	"
David C Hawley	Ks. Ass. for Small Bus.	Wichita
Mawi Hecht	IBM	Topeka

PRESENTATION TO

THE HOUSE ECONOMIC DEVELOPMENT COMMITTEE

JANUARY 29, 1990

Presentation by:

William G. Brundage, Ph.D.
President of
Kansas Technology Enterprise Corporation

House Eco. Dev. Committee
Attachment 1 1/29/90

Established by the State of Kansas in 1987, KTEC's mission is to create and maintain employment by fostering innovation, stimulating the commercialization of new technologies and promoting the creation, growth and expansion of Kansas enterprises.

To achieve its mission, KTEC established a series of programs to meet the needs of Kansas' manufacturing, aviation, agriculture and pharmaceutical industries (attachment D). All of our programs have undergone the strategic planning process and have moved into the implementation stage.

Our programs include (attachment A):

Centers of Excellence;
Applied Research Matching Grants;
Research Equipment Grants;
Training Equipment Grants;
Small Business Innovation Research Grants;
Seed Capital;
Technical Database;
Industrial Liaison; and
Special Projects.

KTEC's successes have been well-documented. In 1989, ten company start-ups or expansions were linked directly to our programs. Those companies which received assistance attribute $4.4 million in increased sales, including more than 270 new jobs for Kansans.

a-1-2
1/29/90

Through KTEC, the State of Kansas' investment has been leveraged more than 2:1 through industry and federal funding, and venture capital. Results include (attachments B and C):

FY 1989	**FY 1984 - FY 1989**
Investment: $4.2 million	Investment: $10.6 million
Leveraged with funding--	Leveraged with funding--
$4.7 million industry	$13.2 million industry
$5.0 million federal	$6.8 million federal
$1.5 million venture cap	$6.5 million venture cap
TOTAL: $11.2 million	TOTAL: $26.5 million
10 company start-ups or expansions	13 company start-ups
	25 company expansions
$4.4 million in increased sales	$12.4 million in increased sales
271 new jobs created	2,200 jobs created
27 new technologies	42 new technologies
7 patents issued or pending	13 patents issued or pending

KTEC is having an impact on existing Kansas companies, helping to create new Kansas companies, recruiting companies to Kansas, and recruiting innovative personnel and investment dollars to Kansas. (attachment E)

We are aware of the fact that many states are funding their KTEC organizations at significantly higher levels than Kansas. However, we do not base our requests for funding upon what other states are receiving. We base our funding requests by setting goals and determining what funding we need to meet these goals. KTEC, in all probability, will not require the levels of funding required by our neighboring states such as Oklahoma.

It remains critical that we receive sufficient funding. The $8.8 million requested for FY 1991 is not a "wish list". This request is based on assessed needs required to reach the goals set by KTEC.

Attachment A

KTEC Summary Report

All Programs
1984 - June 1989

KTEC Investment: $10.6 Million

Leveraged with:
- $13.2 million in industry funding
- $6.8 million in federal funding
- $6.5 million in venture capital

Total: $26.5 Million

Results:
- 13 company start-ups
- 25 company expansions
- $12.4 million in increased sales
- 2,200 jobs created
- 42 new technologies
- 13 patents issued or pending

2-1-4
1/29/90

Attachment B

KTEC SUMMARY REPORT

All Programs
FY 1989

KTEC Investment: $4.2 million

Leveraged with:
$4.7 million in industry funding
$5.0 million in federal funding
$1.5 million in venture capital
Total: $11.2 million

Results:
10 company startups or expansions
$4.4 million in increased sales
271 jobs created

0-1-5
1/29/90

KTEC PROGRAMS

Centers of Excellence
Applied Research Matching Grants
Research Equipment Grants
Training Equipment Grants
Small Business Innovation Research Grants
Seed Capital
Technical Database
Industrial Liaison
Special Projects

Q-1-6
1/29/90

INDUSTRIES

Manufacturing

Aviation

Agriculture

Pharmaceutical

IMPACT

Assist existing Kansas firms

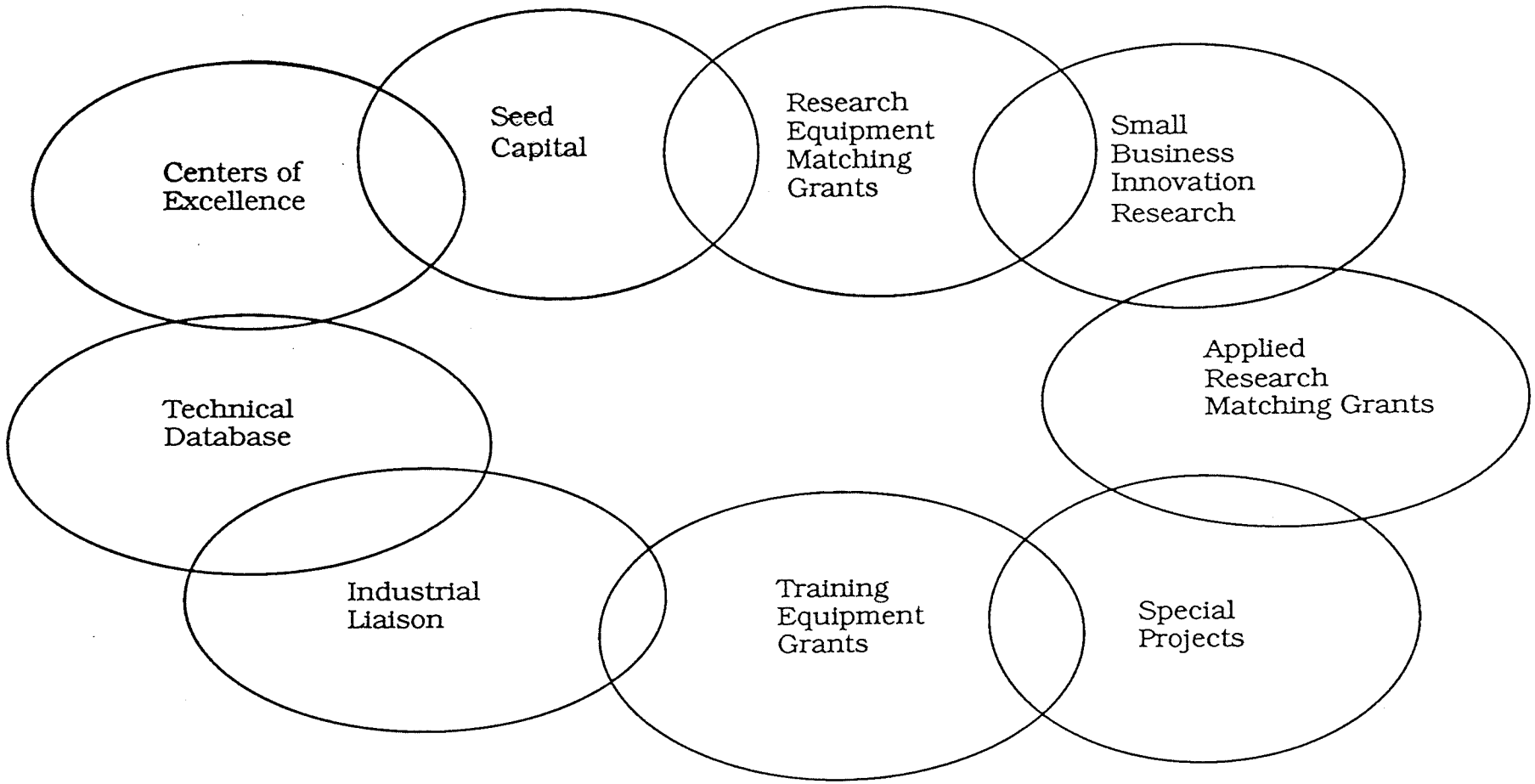
Create new Kansas firms

Recruit (re-locate) firms to Kansas

Recruit (re-locate) innovators and venture capital to Kansas

Attachment F

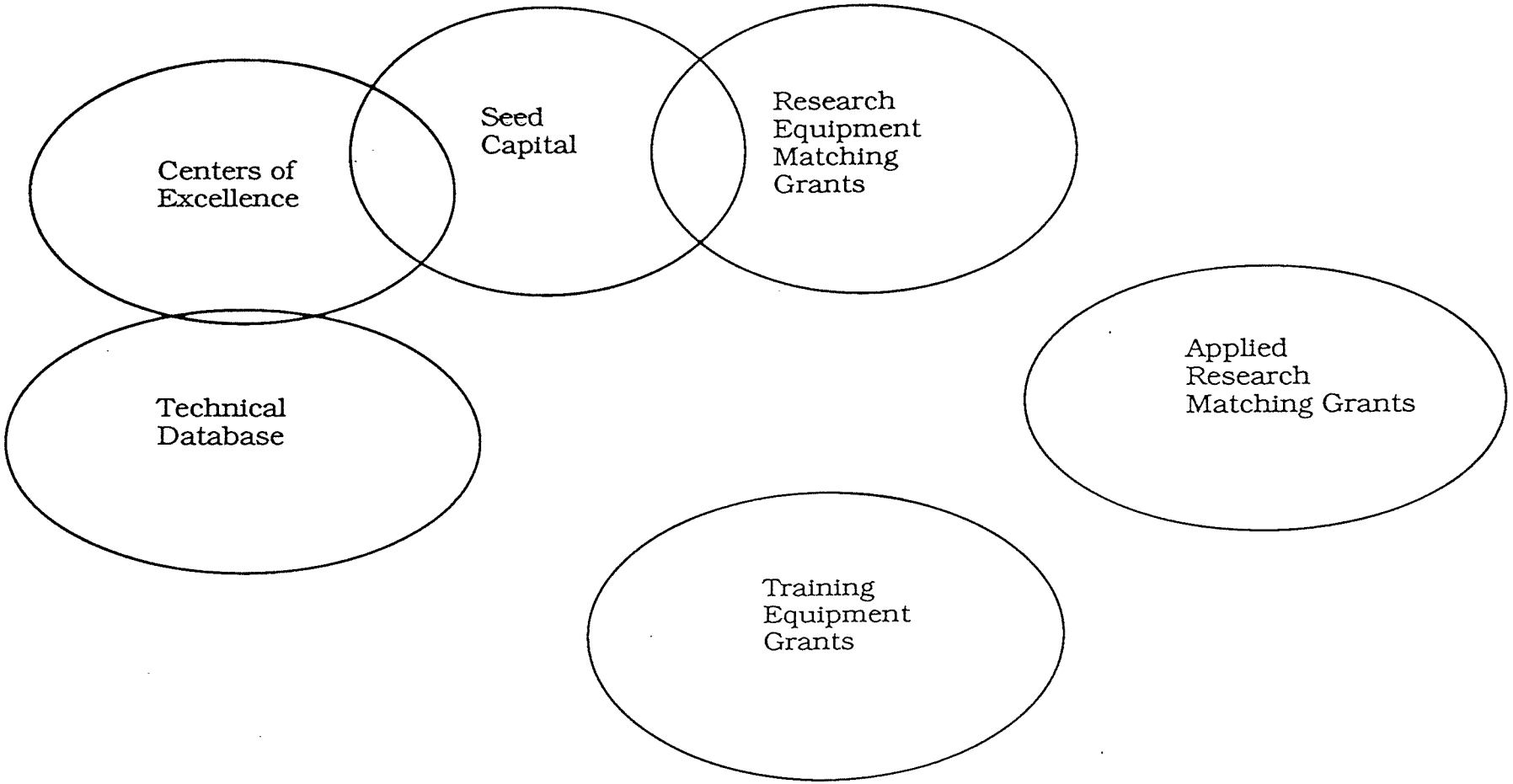
Programs



Kansas Technology Enterprise Corporation

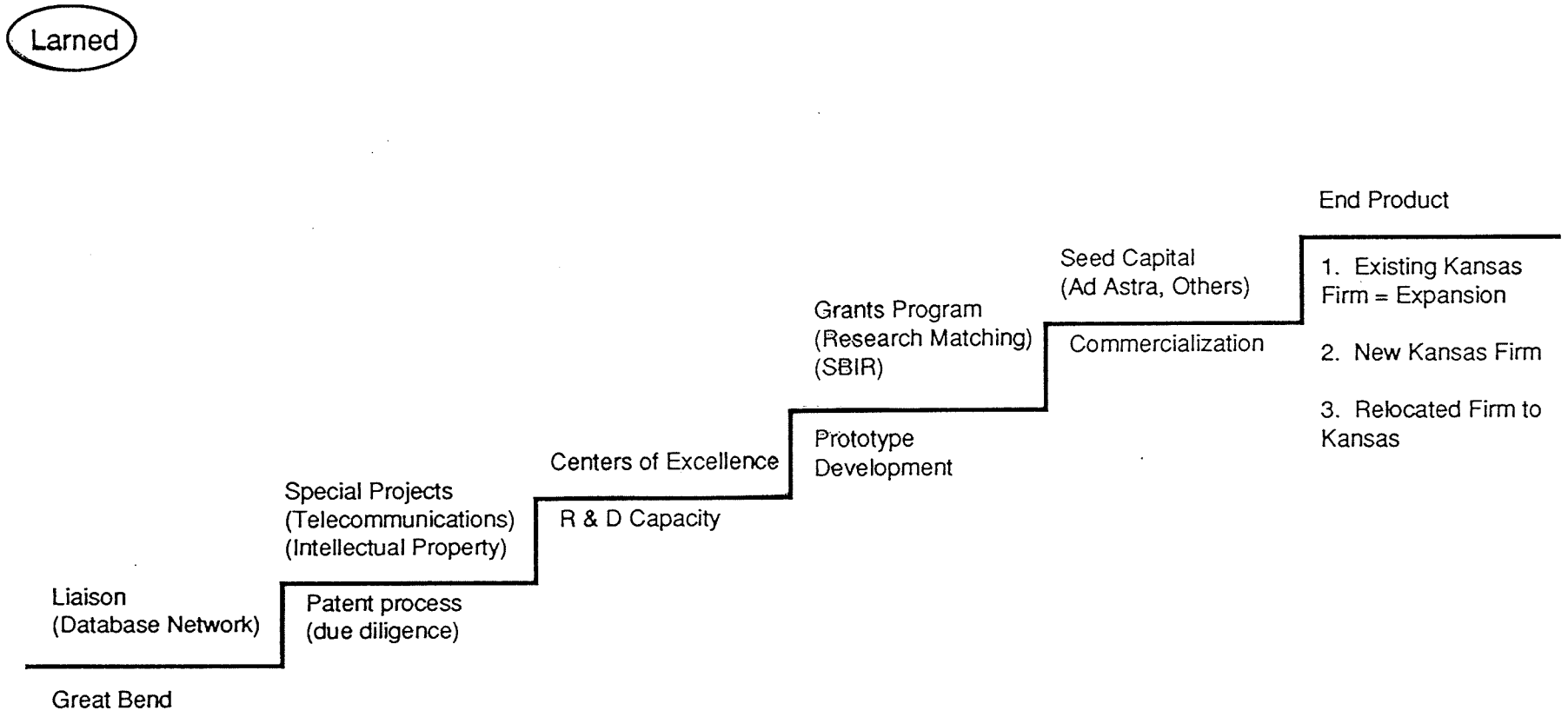
Q-1-9
1/29/90

Programs



Attachment H

STEPS



Kansas Technology Enterprise Corporation

Ck-1-11
1/29/90

INSTITUTE FOR PUBLIC POLICY AND BUSINESS RESEARCH
THE UNIVERSITY OF KANSAS

THE ROLE OF KTEC PROGRAMS IN KANSAS' LONG-TERM ECONOMIC DEVELOPMENT

A Report to the

KANSAS TECHNOLOGY ENTERPRISE CORPORATION

by

Anthony L. Redwood
Professor of Business, Executive Director

Charles E. Krider
Professor of Business, Director of Business Research

M. Elizabeth Stella
Research Associate

January 1990

THE ROLE OF KTEC PROGRAMS IN KANSAS' LONG-TERM ECONOMIC DEVELOPMENT

The 1986 Kansas Economic Development Study (Redwood-Krider Report) and Kansas Inc. identify seven foundations as the focus of the state's economic development strategy. These are:

1. Human
2. Infrastructure
3. Financial Capital
4. Innovation and Technology Development
5. Commitment/Capacity Capital
6. Business Environment
7. Quality of Life

The purpose of this report is to identify the economic significance of the focus upon the fourth foundation, innovation and technology development, and in particular to respond to the possibility that KTEC funding will not be expanded in FY 1990-1991 and indeed could be decreased in FY 1990-1991. This report confirms that KTEC plays a crucial role in the state's economic development strategy, that KTEC funding is below that of competing states, and that long-term, uninterrupted support for KTEC is needed for the state's economic climate to improve.

KEY FINDINGS

1. Part of Kansas' long-term economic development strategy is to facilitate the development and application of technology to Kansas business and industry. U.S. industry, including that of Kansas, is competing in an era of the most rapid technological change in world history. Success in economic development requires long-term, consistent support for innovation and technology development on the part of Kansas industry, or the states' economic fortunes will be determined by external forces and progress will be frustrated by an inadequate response.

a-2-2
1/29/90

2. Kansas is under represented in those industries expected to grow strongly in the future--firms which tend to be technology driven. Technology is the key to firms' ability to remain competitive in the global marketplace. Firms must invest in research to develop new technologies or invest in existing technology to improve products and processes.

3. An important aspect of a state's ability to improve its economic climate is its ability to invest in and sustain its commitment to science and technology programs that support private sector technology competitiveness. Kansas is one of 44 states with state support for science and technology programs. The 1989 National Governors' Association Task Force on Research and Technology recommended that states provide long-term support for programs like those funded by KTEC.

4. Kansas' national rating in technological resources available to business increased from 1988 to 1989 (Corporation for Enterprise Development, 1989), with KTEC programs (e.g., Centers of Excellence, Matching Grants) contributing to that improvement.

5. In FY 1988, Kansas ranked twenty-ninth in per capita expenditure in state technology programs. Kansas invested $1.43 per person while Missouri invested $5.60, Oklahoma invested $3.68, and Iowa invested $1.73. Kansas funding for KTEC for FY 1990 is set at $6.1 million while Oklahoma's equivalent will receive $15.6 million. Kansas cannot afford to retreat from its support for its technology programs at a time when other states are increasing support.

6. For businesses to modernize and be competitive, they must have efficient access to technology. The problem of access is particularly acute for rural manufacturing and other technology related industries. KTEC is an essential component of the state's economic development strategy because it provides the mechanisms for implementing state policy to assist business with the application of technology. Any weakening of support for KTEC would seriously undermine the state's strategy by undermining businesses' access to technology. KTEC funding should be increased so the state does not loose ground in the effort to increase productive capacity through technology.

7. Elimination or reduction of KTEC funding would seriously impede efforts to assist Kansas firms (over 200 in 1989) who seek technological assistance through KTEC programs in order to be competitive in national and international markets.

8. In FY 1989, KTEC's $3 million in state funds were matched by $11.7 million in funds from industry and federal sources to create an investment of $14.7 million in research and related technological activities of importance to Kansas business and industry. This activity has created important linkages between industry and technical expertise at universities necessary to make Kansas firms more competitive in the global marketplace, and the linkages would be at risk if KTEC funding were reduced.

9. KTEC is fostering significant partnerships between state universities (where technical expertise resides) and businesses throughout the state. Kansas businesses must have efficient access to research, technical expertise, and technology available at universities. Most Kansas businesses are small, and often rural, and would have difficulty accessing research, technology, and technical expertise without programs funded by KTEC.

10. Reduction or disruption of KTEC funding would send signals to industry in Kansas, other states, and other countries that Kansas is not developing a climate necessary for technological survival.

11. Failure to support KTEC programs will result in loss of opportunity to capitalize upon research discoveries (take research results out of the lab and to the marketplace), create new firms, and create new jobs.

I. IMPORTANCE OF TECHNOLOGY AND KTEC

In 1986, KTEC was established 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" (K.S.A. 74-8101). KTEC was needed to facilitate the development and application of technology to Kansas business and industry. Because of rapidly changing technology, firms who do not keep up with technological advances risk failure because they cannot remain competitive in markets that are expanding and becoming more international. Research shows that firms who do not keep up with technological change risk failure, those who keep current will reduce their losses, and those who lead technological change will profit from their innovations. Thus, an important aspect of a firm's competitiveness is its ability to keep up with or lead in technological innovation, and an important aspect of a state's competitiveness is its ability to produce or attract firms that lead technology change.

Technology is a dynamic process involving the application of knowledge, resources, and technique to problem solving. To maintain and attract firms that

can lead technology change and have a positive impact upon the state's economy, state support for science and technology programs must be maintained and must be long-term in nature. The National Governors' Association Task Force on Research and Technology (1989) recommended that state actions should focus upon:

1. Long-term direct support for research and development including collaborative research projects between industry and higher education;
2. Enhancing the climate for innovation by developing guidelines for converting ideas into products through seed capital programs, expanding advanced technology and industrial research centers and strengthening incentives for university-industry collaboration;
3. Helping develop products for the international marketplace.

Kansas has already taken action in areas recommended by the Governors' Task Force through KTEC programs. KTEC's mission is to help Kansas' businesses, most of whom are quite small, survive in a technologically competitive marketplace. Because technology plays such a key role in a firm's competitive advantage, access to technology is critical to growth. If the Kansas economy is to reverse its tendency to grow at rates below the national average, Kansas firms must become technologically competitive. Most small Kansas businesses do not have the resources to fund the research necessary to keep up with or lead in technological advances. KTEC programs help businesses, large and small, gain efficient access to the research capacity and technical expertise at the state's universities through Centers of Excellence, Applied Research Matching Grants, etc. Table 1 shows that, in 1989, KTEC used $3 million in state funds to create nearly $11.6 million in industry and federal support for science and technology activity.

TABLE 1

1989 LEVERAGE OF KTEC FUNDS

Program	KTEC Funds	External Funds	TOTAL
Centers of Excellence	$1,291,500	$8,802,210	$10,093,710
Matching Grants (Applied Research, Research Equipment, and Training Equipment)	$1,736,240	$2,868,026	$4,604,266
TOTAL	$3,027,740	$11,670,236	$14,697,976

Source: *KTEC Annual Report*, 1989.

II. SUMMARY OF STATES' SCIENCE AND TECHNOLOGY FUNDING

Most states have implemented science and technology programs.

* Kansas is one of 44 states with science and technology programs and one of 29 states with Centers of Excellence.

* In fiscal year (FY) 1988, these 44 states invested an average of $11.25 million in programs similar to KTEC, or more than three times Kansas' investment in KTEC.

* In FY 1988, the five leading states in science and technology programming invested an average of $50 million in their programs.

* In FY 1988, Kansas invested $3,550,000 in its science and technology programs while three neighboring states with similar programs invested an average of $16 million (Missouri, $28,566,000; Oklahoma, $12,046,375; New Mexico, $7,654,000). For FY 1990, the Oklahoma Center for the Advancement of Science and Technology has received $15.6 million, while KTEC is to receive $6.1 million. To date, Oklahoma has invested $18 million in three Centers of Excellence while KTEC has been able to invest $7.9 million for core funding in five centers.

* In FY 1988, Kansas ranked twenty-ninth in per capita expenditure in state technology programs. Missouri ranked third and Oklahoma ranked tenth in dollars spent per capita.

* In FY 1988, Kansas invested $1.43 per person while neighboring states with similar science and technology programs invested an average of $4.79 per person (Missouri, $5.60; New Mexico, $5.10; Oklahoma, $3.68; Iowa, $1.73). See Appendix A for a complete listing of states' expenditures.

a-2-6
1/29/90

III. SUMMARY OF KTEC PROGRAMS

To help Kansas business and industry develop and apply technology to facilitate growth and expansion, KTEC created several mechanisms to create links (e.g., Centers of Excellence, Applied Research Matching Grants) between business and the expertise available at research universities.

Centers of Excellence

Centers of Excellence are university-based research centers that seek to advance basic and applied knowledge in science and technology, develop new technologies and transfer these technologies to Kansas businesses for commercial development. Thus, centers are designed to help existing business and create new businesses. Each center has a research focus that builds upon strengths of the institution, or upon real potential of the institution to achieve international recognition for excellence.

Five Centers of Excellence have been established as an important mechanism for positioning Kansas in certain targeted industries. These centers are a critical component of the infrastructural requirements for building an entrepreneurial environment necessary to create a stronger state economy. This entrepreneurial environment is needed to link the state's small pool of scientists, engineers, businessmen and women, market experts, seed capital and venture capital. Because Kansas' scientists are largely located at its major research universities, partnerships between universities and the private sector must be fostered if the state and its businesses are to be competitive in the national and international economy. Loss of or interruption of funding for these centers would not only mean loss of jobs, it would also result in loss of $8.8 million in industrial matching funds, loss of over $10 million in research of economic importance, and loss of assistance to over 200 Kansas firms seeking

technical assistance (Table 2).

Table 2

CENTERS OF EXCELLENCE: 1989 IMPACT

CENTER:	FUNDING:[1] KTEC	External	TOTAL	JOBS:[2] Center	NewJobs	TOTAL	NO.CO. ASSISTED	NEW TECH.[3]
IAR (WSU)	$412,500	$892,548	$1,305,048	23	90	113	25	5
HBC (KU)	328,500	7,390,654	7,719,154	47	26	73	6*	10
CTT (PSU)	135,500	344,008	479,508	54	98	152	96	NA
CRCCA (KSU)	240,000	175,000	425,000	46	47	93	36	13
KVAC (KSU)	175,000	NA	175,000	6	NA	6	76**	NA
TOTAL	$1,291,500	$8,802,210	$10,093,710	176	261	437	239	28
% of TOTAL	13%	87%						

[1] Funding: KTEC = Core funding; External = Grants and contracts from federal and industrial sources

[2] Jobs: Center = Full and part time positions for Center staffing; New Jobs = Jobs created in industry as a result of Centers' activities

[3] New Technology: New processes and technologies developed as a result of Centers' activities

* The main focus of the Higuchi Biosciences Centers is the pharmaceutical industry. Because this industry is in its infancy in Kansas, there are few companies to assist. Rather, the main focus of Center activity is building the industry by starting new companies and attracting pharmaceutical companies to locate in Kansas.

**Many of these companies are repeat contacts for services.

Source: *KTEC Annual Report*, 1989; Centers of Excellence, 1989.

More importantly, and more difficult to quantify, would be the loss of opportunity to form new businesses, and loss of opportunity to attract entrepreneurs and venture capital to locate near valuable human resources which has begun to occur around the Centers of Excellence. For example, loss of KTEC funding at the Higuchi Biosciences Center at the University of Kansas would result in loss of industrial matching funds, loss of involvement of key research

a-2-8
1/29/90

faculty and staff which would stop almost all of the Centers' research activity. In effect, the Higuchi Biosciences Centers would cease to exist, and with it would go the opportunity to lure biotechnology based activities and industry to the state. Reduction of KTEC's funding for Centers of Excellence would also mean that the state would loose it ability to influence research toward areas having greatest economic development potential for the state's business and industry.

Seed Capital Fund

A second mechanism established by KTEC is the seed-capital fund (Ad Astra Fund, L.P.) needed to provide monies for start-up or early stage companies which have an advanced technology base. This mechanism, started late in 1988, provides critical support for the commercialization process (moving technologies to the marketplace). As of 1988, Kansas was one of ten states with seed capital/venture capital programs. KTEC has put $1.56 million into the fund which will be combined with funds contributed by other partners to the fund.

Because small technology-based businesses are sources of rapid growth, supporting the commercialization process for these firms through a seed-capital fund is a key element in the state's economic development. The seed-capital fund provides an important method for capitalizing on new technologies developed in Kansas. Without means of financing the new ventures, few research discoveries made in the state's research universities can be brought to the marketplace. Instead, industry in other states and countries will patent the results and reap the financial benefits of marketing the technologies.

Matching Grants

The third mechanism established by KTEC helps business and industry upgrade products and processes through application of advances in technology. An important purpose is to cultivate university-industry linkages so that the

research agenda of Kansas universities can become more relevant to the needs of Kansas industries and so that Kansas industry can enhance the research base of the universities. To assist in this important activity, KTEC established various matching grant funds. These funds play a key role in the third critical aspect of technology development--the transfer or application of scientific and technological knowledge to existing businesses and industries (Table 3). KTEC has leveraged its funds to assist such industries as agriculture, aviation, oil and gas, manufacturing, pharmaceuticals, computers and electronics, medical instrumentation, telecommunications, and computer software (See Appendix B for detailed description of industries served).

Table 3
KTEC MATCHING GRANTS: 1989

FUND	KTEC	MATCH	TOTAL
Applied Research Matching Grants	$486,922	$ 893,387	$1,380,309
Research Equipment Matching Grants	999,318	1,281,679	2,280,997
Training Equipment Matching Grants	250,000	692,960	942,960
TOTAL	**$1,736,240**	**$2,868,026**	**$4,604,266**
% of TOTAL	**38%**	**62%**	

Source: *KTEC Annual Report*, 1989.

IV. IMPACT OF FUNDING CUTS

Interruption of funding for the programs described above would seriously damage Kansas' economic development. Interruption of funding would result in loss of participation of key people in the programs begun by KTEC. If funding were restored after serious cutbacks or interruption of funding, the state would have to begin from the beginning in its efforts to build a technologically

9-2-10
1/29/90

competitive and diversified state economy due to losses of key personnel and other less visible assets. These less visible assets that KTEC has built up over the past three years include creating a climate of long-term commitment to developing a technologically competitive and diversified state economy, building private-public partnerships, and providing faster access to technology.

Establishing a Technologically Competitive and Diversified Economy

The economy of Kansas must diversify if the state's citizens are to maintain and improve their standard of living. The state's economy has been dependent upon the oil-gas, aviation, and agriculture industries. This dependence has contributed to Kansas' low employment growth, continuation of the "brain drain," and the aging of the state's population as young people leave in search of better employment opportunities. Another indicator of sluggish economic performance is that the rate of business growth. Nationally, Kansas ranks **thirty-fourth** in **fast growth** companies (1989 Development Report Card for the States, Corporation for Enterprise Development). Because the state has not been attractive to new, technologically based industry, rates of growth of advanced technology firms lagged significantly behind that of the U.S., making it extremely difficult for the state to establish a strong, diversified economic base.

Because Kansas ranks **thirty-eighth** in number of scientists and engineers per 1,000 workers, a technologically based and competitive economy will not occur because the scientific and engineering talent necessary to make it occur is not present in large enough numbers. KTEC programs that create links between scientists and engineers in universities (e.g., KU Higuchi Biosciences Centers and the pharmaceutical industry; WSU Institute for Aviation Research and the aviation industry) play a critical role in maximizing the state's scientific and

engineering resources for the technological advancement and technology transfer needed to build a diversified economy. A climate of technological activity must be developed because technology-based industry requires highly skilled workers, excellent research and development programs, and financial institutions willing to back high-risk ventures, in addition to basic infrastructure and amenity resources. Because Kansas ranks low in technological resources, financial resources, and infrastructure, its ability to attract advanced technology firms is restricted (Table 4). However, the state has made progress in improving its ranking in technological resources because of such programs as KTEC. Thus, the investments in state science and technology programs (KTEC) have had an impact. As stated by the Corporation for Enterprise Development (*1989 Development Report Card for the States*):

> "The hard fact of political and economic life is that it takes time, and long-term commitment to investments on the part of both public and private players to create fundamental change in a state's economic climate...Change in a state's economic climate begins when public and private players in the economy agree that they need to take steps, together, to build up the development capacity of the state economy. Private industry invests in its people and in technology to increase productive capacity. The public sector invests in its capacity to support private sector development--assuring skilled workers, well-maintained infrastructure, support for technology development, accessible capital, efficient government, fair taxes and so forth...Over time, changes in policy bring about changes in development capacity. Greater capacity nourishes businesses and increases business vitality. Finally, and often years later, vital businesses create improving economic performance...If consistently pursued, policies incorporated in the Index will lead, in time, to a better economic climate--to greater economic capacity, more vital businesses and stronger overall economic performance. If they are not pursued, or are pursued inconsistently, a state's economic fortunes will continue to be determined by external forces, and progress will be frustrated by insufficient capacity." (pg. 70-71)

Table 4

C.E.D. BUSINESS CAPACITY REPORT CARD

SUBINDEX	1988 RANK	(GRADE)	1989 RANK	(GRADE)
Human Resources (high school graduates, adult literacy, college education attainment)	12	(B)	11	(B)
Technological Resources (scientists-engineers in work force, science-engineering doctoral students, patents issued, university R&D, federal R&D)	36	(D)	35	(C)
Financial Resources (bank deposits, loans to equity, commercial & industrial loans, venture capital investments, dividends-interest-rent income)	39	(D)	26	(C)
Infrastructure & Amenity Resources (highway-bridge condition, sewage treatment needs, housing cost, doctor availability, foundation grant funds distribution, tourism spending)	39	(D)	38	(D)
OVERALL	33	(C)	30	(C)

Source: Corporation for Enterprise Development, *Making the Grade: The 1988 Development Report Card for the States*, (April), 1988; *The 1989 Development Report Card for the States*.

Private-Public Partnerships

Prior to the implementation of the Centers of Excellence, the seed-capital fund, and the Applied Research Matching Grant Fund, there was a limited history of cooperation and partnership between university research scientists and the state's private sector. These KTEC programs have provided the critical contact points and climate for this cooperation to grow. Interruption of KTEC funding would destroy industrial partnerships by sending industry the fatal message that state-supported programs are a bad investment. In effect, the legislature will be telling business and industry that the state is not able to follow through on long term commitments that were made to help business cope with the crisis

they are facing. That crisis includes having access to technically advanced equipment, basic and applied research, and funds for commercialization of research results. When the state fails to support its commitments to such critical activities, businesses in Kansas, the U.S., and foreign countries receive the message that the state is not developing the climate necessary for technological survival. Once shaken, that confidence may be extremely difficult to rebuild. Private-public partnerships will not develop into the naturally-occurring activity necessary for a climate of economic growth to occur.

Faster Access to Technology

KTEC's programs are designed to play a key role in the diversification of the state's economy by encouraging growth of technology oriented industry. Interruption of funds would result in fewer start-ups, fewer relocations of industry into Kansas (industry tends to go to states where technical assistance is offered), and fewer expansions. Start-up, relocation, and expansion of businesses is driven, in part, by technological competition. If firms are not technologically competitive, their production costs are higher, their products' quality lower, and/or they are not adaptable to the growing demand for customized products. The firms then lose markets, sales decrease, and employment decreases. Without efficient access to technology, firms cannot compete with other firms nationally and internationally. This cycle can be broken by making technology efficiently accessible through programs like those supported by KTEC. Breaking the cycle is critical if small, technology oriented firms are to survive. Only then will the Kansas economy become more diversified and be fueled by the rapid growth that only small, technologically competitive businesses can provide.

a-2-14
1/29/90

V. CONCLUSIONS

1. KTEC programs are targeted to achieve long-term economic development goals that are critical to the Kansas economy.

2. Interruption of or reduced commitment to KTEC programs may provide some short-term relief to other funding problems but would have very serious negative impact on both short-term and long-term economic development in the state.

3. For the state to break out of the short-term and long-term economic difficulties it faces, it must remain committed to diversification of its economic base which means committing to helping existing industry become technologically competitive by supporting technology transfer (KTEC matching grant funds) and committing to building technology based industry through support of technology development (basic research through Centers of Excellence) and commercialization (seed-capital funds).

4. Failure to provide state support for KTEC programs will result in loss of opportunity to capitalize upon research discoveries occurring at research universities, to start new firms to take those discoveries to market, and to encourage firms to relocate or expand in Kansas. This means loss of dollars and jobs.

5. Kansas cannot afford to back away from its science and technology programs at a time when other states and other countries are increasing their efforts to support programs designed to provide technological support and leadership.

6. KTEC funding is part of a long-term investment for the state's economic development that must be consistent to be effective. Research and technology transfer activity requires investments in technical expertise (scientists, engineers) and equipment that, once stopped, cannot be quickly restored. In a period of rapid technological change, such interruptions are extremely costly to correct.

7. Reduction in KTEC funding would signal a reduction of support for technology in Kansas at a time when the state's ranking in technological resources was improving.

1988 STATE TECHNOLOGY PER CAPITA EXPENDITURES

	STATE	FUNDING	POPULATION	PER CAPITA	
1)	NEW JERSEY	76,345,000	7,672,000	9.95	
2)	MINNESOTA	39,439,200	4,246,000	9.29	
3)	MISSOURI	28,566,000	5,103,000	5.60	
4)	NEW MEXICO	7,654,000	1,500,000	5.10	
5)	MONTANA	3,550,000	809,000	4.39	
6)	SOUTH DAKOTA	3,050,000	709,000	4.30	
7)	PENNSYLVANIA	49,050,000	11,936,000	4.11	
8)	WISCONSIN	18,978,000	4,807,000	3.95	
9)	CONNECTICUT	12,550,000	3,211,000	3.91	
10)	OKLAHOMA	12,046,375	3,272,000	3.68	
11)	NORTH CAROLINA	23,357,000	6,413,000	3.64	
12)	TEXAS	60,690,000	16,789,000	3.61	
13)	MISSISSIPPI	9,300,000	2,625,000	3.54	
14)	UTAH	5,187,000	1,680,000	3.09	
15)	TENNESSEE	13,109,400	4,855,000	2.70	
16)	HAWAII	2,851,000	1,083,000	2.63	
17)	DELAWARE	1,650,000	644,000	2.56	
18)	MASSACHUSETTS	14,665,000	5,855,000	2.50	
19)	WASHINGTON	11,000,000	4,538,000	2.42	
20)	FLORIDA	27,958,000	12,023,000	2.32	
21)	ARIZONA	7,000,000	3,386,000	2.07	
22)	RHODE ISLAND	2,000,000	986,000	2.03	
23)	INDIANA	10,637,500	5,531,000	1.92	
24)	GEORGIA	11,094,430	6,222,000	1.78	
25)	IOWA	4,895,000	2,834,000	1.73	
26)	OHIO	18,000,000	10,784,000	1.67	
27)	MARYLAND	7,365,750	4,535,000	1.62	
28)	VIRGINIA	9,400,000	5,904,000	1.59	
29)	KANSAS	3,550,000	2,476,000	1.43	
30)	MICHIGAN	13,063,500	9,200,000	1.42	
31)	ARKANSAS	3,150,000	2,388,000	1.32	
32)	NEW YORK	22,129,300	17,825,000	1.24	
33)	ILLINOIS	13,540,000	11,582,000	1.17	
34)	COLORADO	3,700,000	3,296,000	1.12	
35)	OREGON	2,215,000	2,724,000	0.81	
36)	ALABAMA	2,855,205	4,083,000	0.70	
37)	NEBRASKA	858,000	1,594,000	0.54	
38)	NORTH DAKOTA	207,000	672,000	0.31	
39)	CALIFORNIA	5,900,000	27,663,000	0.21	
40)	NEW HAMPSHIRE	200,000	1,057,000	0.19	
41)	MAINE	184,280	1,187,000	0.16	
42)	KENTUCKY	560,000	3,727,000	0.15	(FY89)
43)	WEST VIRGINIA	150,000	1,897,000	0.08	
44)	ALASKA	30,000	525,000	0.06	
45)	IDAHO	0	998,000	0.00	
46)	LOUISIANA	0	4,461,000	0.00	
47)	NEVADA	0	1,007,000	0.00	
48)	SOUTH CAROLINA	0	3,425,000	0.00	
49)	VERMONT	0	548,000	0.00	
50)	WYOMING	0	490,000	0.00	

Source: Minnesota Department of Trade and Economic Development (1988). *State Technology Programs in the United States.*

A-2-16
1/29/90

KTEC 1989 ANNUAL REPORT

Applied Research Matching Grant Fund

KTEC awards Applied Research Matching Grants to Kansas educational institutions and private enterprises in order to move innovation and applied research toward commercial application. Projects must apply the existing store of scientific and technological knowledge and lead to new developments that can have a positive impact on the Kansas economy. The program emphasizes applied research for both small and large companies. KTEC grants must be matched 150% by the sponsoring company.

In FY 1989, the Applied Research Committee reviewed 38 research proposals for their potential to lead to innovation, new knowledge or technology; to expand the technological base within the state for the given field of research; to enhance employment opportunities within Kansas; and to be technically sound and produce measurable results. Based on staff investigations and committee recommendations, the board of directors awarded 21 applied research matching grants for a total of $486,922 in state funds. These funds were matched with $893,387 in industry funds for a joint investment of nearly $1.4 million in innovative research partnerships.

Sponsoring companies represent industries of special importance to the Kansas economy, including agriculture, aviation, oil and gas, manufacturing, pharmaceuticals, computers and electronics, medical instrumentation, telecommunications and computer software. Award recipients have estimated that the resulting technologies could create as many as 575 new jobs over the next two years.

APPLIED RESEARCH MATCHING GRANTS

Project Title	Sponsor	Match	Grant
Kansas State University			
In Situ Biodegradation	Groundwater Management, Inc. Kansas City, KS	$10,053	$5,333
Development of Electrically Conductive Adhesives for Composite Systems	Beech Aircraft, Wichita, KS	$12,000	$8,000
Development of Computer Program to Analyze Fracture in Layered Structures	Boeing Military Airplanes, Wichita, KS	$20,000	$13,333
Continuous Feed Round Hay Baler	Hay and Forage Industries, Hesston, KS	$17,328	$11,552
Bi-Rotor Combine Harvester Development	Agritechnology, Coffeyville, KS	$26,818	$14,114
TOTAL		$86,199	$52,332
Pittsburg State University			
Determining the Proper Procedure for Etching PC Boards with an Organic Material	PC Boards, Inc. Chanute, KS	$41,600	$27,700
Analysis and Design of a Sterile Compaction System for the Medical Profession	Dubbert Industries, Shawnee KS	$11,000	$7,300
The Effect of Tensile Strength Tests and Impact Tests on Selected Plastic Bags	Pitt Plastics, Pittsburg, KS	$7,700	$5,100
Americanization for Production and Implementation of the Passenger Air Bridge	Wiseda Corp., Baxter Springs, KS	$127,395	$73,930
Bioresorbable Clip for Castrated Bulls	K-Vet Inc., Washington, KS	$14,940	$9,960
TOTAL		$202,635	$123,990
University of Kansas			
Ultra-sensitive Computerized Electrochemical Instrumentation and Special Spectroelectrochemical Cells	Cypress Systems, Lawrence, Ks.	$48,000	$32,000
Calculation of High-Angle-of-Attack Aerodynamic Characteristics of Airplane Configurations	Boeing Military Airplanes,Wichita, KS	$29,147	$13,494
Aircraft Aerodynamics for Deflected Jets in Ground Effect Airplanes	Boeing Military Airplanes, Wichita, KS	$29,752	$13,774
TOTAL		$106,899	$59,268

2-17

SBIR Matching Grant Program

Federal agencies grant $400 million annually to innovative small firms under the Small Business Innovation Research (SBIR) Program. SBIR awards are highly competitive, based on excellence in technological innovation as well as marketability. Phase I federal awards, for feasibility research, are normally up to $50,000. Phase II awards of up to $500,000 are used for product development. State cost sharing in the application for an SBIR grant can be critical to the receipt of federal funds.

KTEC provides matching funds to Kansas small businesses for preparation of proposals under the federal Small Business Innovation Research (SBIR) program. Companies meeting the requirements are eligible for up to one-half of the cost of preparing Phase I and Phase II SBIR proposals, up to a maximum of $5,000 per proposal. An eligible company may receive up to three awards from KTEC annually.
KTEC also offers a support network for SBIR concept evaluation, identification of appropriate SBIR solicitation topics, federal agency contact, and technical assistance. This network includes academic researchers, industry experts, SBIR awardees, KTEC staff, business consultants, economic development organizations, and proposal writers. Costs involved in utilizing this network qualify for SBIR matching funds.

Project Title	Sponsor	Match	Grant
Wichita State University			
Producibility Study—Aircraft Interiors - Cabinets and Furnishings	Precision Pattern, Inc., Wichita, KS	$13,498	$8,998
Structural Composite Producibility Study	Beech Aircraft, Wichita, KS	$20,434	$13,623
Relaxation in Bolted Composite Joints	Boeing Military Airplanes, Wichita, KS	$31,958	$21,305
Shear Buckling Characteristics of Composite Panels with Holes and Beads	Boeing Military Airplanes, Wichita, KS	$31,996	$15,066
Flight Control Computer Performance & Reliability Analysis	Boeing Military Airplanes, Wichita, KS	$23,675	$10,510
Improvement in Aerodynamic Capability of Low Observable Aircraft Configuration by Passive and Active Flow Control Devices	Boeing Military Airplanes, Wichita, KS	$40,087	$24,493
TOTAL		$161,648	$93,995
Miscellaneous			
Research and Development of an Alternate Delivery and Pricing System for Hard White Winter Wheat	American White Wheat Producers Association, Hutchinson, KS	$56,006	$37,337
Advancement of Telerobotics Systems, CRINC	Kraft TeleRobotics, Inc., Overland Park, KS	$280,000	$120,000
TOTAL		$336,006	$157,337
GRAND TOTAL		$893,387	$486,922

RESEARCH EQUIPMENT MATCHING GRANTS

In its quest to enhance market-driven research in Kansas, KTEC awarded nearly $1 million in 10 research equipment grants in FY 1989.

KTEC provides equipment grant monies to academic institutions in areas of strength with economic development potential. Research equipment grants must be matched by funds from industrial sponsors. The industrial or university match for 1989 totaled nearly $1.3 million.

Following are the Research Equipment Grants made in FY 1989:

Project	Sponsor	Match	Grant
Kansas State University			
Special Research Equipment for the CRCCA Integrated Design, Manufacturing, and Assembly Research Laboratory	U.S. Department of Education, KSU	$375,000	$295,000

(Continued on page 10)

a-2-18
1/29/90

Ad Astra Fund

In late 1988, KTEC formed a limited partnership with Sam Campbell, president of Campbell-Becker, Inc., a venture capital management firm in Lawrence, Kansas. The partnership, called Technology Partners Limited Partnership, is the general partner of the seed-capital fund known as Ad Astra Fund, L.P. (Fund).

The Fund was established to provide seed capital monies to start-up or early stage companies which have an advanced technology base. The Fund seeks quality, high return potential investments in companies whose technology has a broad market appeal and a management team which is highly motivated, capable and dedicated to the creation of a successful business.

KTEC is also a limited partner in the Fund. In 1988, KTEC earmarked $560,000 for investment in the Fund and in FY 1989, transferred an additional $990,000 to the Fund.

The objectives of the Fund are three-fold: to enable KTEC to significantly leverage the money appropriated by the state for seed-capital investment with private sector funds; to ensure that the Fund will be managed by experienced professionals; and, to provide KTEC with a vehicle to assure the best possible investments that will impact the Kansas economy.

Sam Campbell will seek additional Limited Partners in order to capitalize the Fund with at least $5 million. This minimal fund is to be raised by January 31, 1990.

Project Title	Sponsor	Match	Grant
Equipment Grant Proposal for Support of a Center for Extrusion Processing Research	Wenger, Inc., Sabetha, KS	$223,390	$88,302
Research Equipment for the Development of Food Products	General Mills, KSU, KSU Foundation	$4,900	$8,505
Silent Cutter for Value-Added Meats Research	Dillons, Dokocil IBP	$19,095	$44,555
TOTAL		$622,385	$436,362
Pittsburg State University			
Plastics Engineering Laboratory Proposal	U.S. Department of Education	$139,800	$33,089
TOTAL		$139,800	$33,089
University of Kansas			
Confirmational Identification of Biological Substances with Liquid Chromatography/Mass Spectrometry	Shimadzu Scientific Instruments, Inc., Columbia, MD	$49,217	$115,804
Confirmation and Structure Determination of Biopolymers and other Biologically Active Substances with Fourier Transform Infrared Spectrometry	National Institutes of Health	$25,437	$15,613
Solid State Nuclear Magnetic Resonance Spectrometer Accessory	Marion Lab, FMC, INTERx, Oread Lab, KU	$17,000	$26,840
Field Emission Scanning Electron Microscope	National Institutes of Health	$171,570	$73,530
TOTAL		$263,224	$231,787
Wichita State University			
Dynamic Testing Facility	Federal Aviation Authority	$256,270	$298,080
TOTAL		$256,270	$298,080
GRAND TOTAL		$1,281,679	$999,318

KTEC 1989 ANNUAL REPORT

Special Projects

KTEC completed one special project and initiated two new special projects in FY 1989.

A special project on biotechnology culminated in February with the publication of "BioTech Ks, a strategic plan for the initiation and encouragement of biotechnology-based economic development in Kansas." The report was compiled by Dr. Charles Decedue, Program Development Director, and senior scientist for the University of Kansas Biochemical Research Laboratory.

In a new undertaking, KTEC collaborated with Southwestern Bell to evaluate the potential for a statewide teleconferencing network. Southwestern Bell assigned a full-time communications specialist to KTEC for one year, effective September 1, 1988, to assess needs and evaluate available technology for switched broadband video use by Kansas businesses. This initial probe expanded to what is known today as the Kansas Telecommunications Consortium. In mid-1989, a Consortium of telecommunications providers and users advanced the project to develop a strategic plan. Demonstration projects are currently underway, and a part-time director to chair the Consortium will be employed beginning in September 1989.

The protection of intellectual property through copyrights, trademarks and patents is a vital concern to innovators. To address this need, KTEC initiated a proposal to develop a comprehensive strategy for assisting innovative Kansans. The program's goal is to increase Kansas' share of the number of patents and other documentation issued in the U.S. and internationally for the protection of intellectual property. This project will be expanded in FY 1990.

TRAINING EQUIPMENT MATCHING GRANTS

In June, 1989, KTEC made its first Training Equipment Grants to four Kansas Vocational-Technical Schools and Community Colleges.

Guidelines allowed for grants of a minimum of $25,000 to a maximum of $100,000 with a required dollar for dollar institutional match. Proposals were expected to: address the economic impact and utilization of the equipment; include a statement of the potential effect on the area economy; explain the impact on particular industries now and over the next five years; and describe both the potential for developing new start-up companies, and the potential for generating new jobs.

The review process included investigation by personnel from the Kansas State Department of Education with the assistance of technical and business peer reviewers.

The following awards were made in 1989:

Project	Sponsor	Match	Grant
Basic Fiberglass Work Skills	Neosho County Community College	$38,551	$38,551
Computer Integrated Manufacturing	Wichita Area Vocational Technical School	$142,475	$70,483
Real Time Instrumentation Technology Simulation	Kansas City Ks., Community College	$196,810	$70,483
Industrial Production Technology	Garden City Community College	$315,124	$70,483
TOTAL		$692,960	$250,000

9-2-20
1/29/91P