THE UNIVERSITY OF KANSAS
Institute for Public Policy and Business Research
School of Business
Department of Economics
RESEARCH PAPERS

Sixth Assessment of the Science, Math and Engineering Infrastructure at Three Universities in Kansas: Case Studies of Four Peer Institutions

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prepared for

K*STAR
NSF EPSCoR Project

by

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June, 1998
Report No. 247

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Acknowledgements

The case study of four peer institutions was part of an annual assessment project supported by the K*STAR NSF EPSCoR program. We wish to thank faculty and staff at Arizona State University, Colorado State University, the University of Colorado, and the University of Iowa for their assistance with and participation in the interviews at the universities. We would also like to thank Monica Lemmons for organizing the interviews with the institutions.

A copy of this report may be obtained from the K*STAR NSF EPSCoR, 207 Strong Hall, University of Kansas, Lawrence, Kansas 66045.

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Introduction

In 1992, Kansas became a National Science Foundation (NSF) EPSCoR (Experimental Program to Stimulate Competitive Research) state to improve its ability to compete for federal research and development (R&D) dollars. At that time, a plan was developed to assess progress in making Kansas more competitive for federal R&D dollars. Annual assessments of the status of science, engineering, and mathematics (SEM) research and infrastructure at the state's three Ph.D. granting institutions (the University of Kansas, Kansas State University, and Wichita State University) have occurred since 1992. Assessment of the impact of the first three years of NSF EPSCoR funding revealed that the state's competitive position was improving, especially for faculty who received EPSCoR funds.[1] However, declines in infrastructure occurred in 1995 and 1996 illustrating that past improvements in Kansas' competitive position may be very fragile.[2]

It was determined that the sixth assessment process should include a case study analysis of peer institutions that have had some success in obtaining external funding. The purpose of the case studies is to learn from the experience of other universities to increase the external funding in Kansas.

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[1] Stella, M. Elizabeth, *Fifth Assessment of the Science, Engineering, and Math Infrastructure at Three Universities in Kansas*, IPPBR: the University of Kansas, December 1996.
[2] Ott, Genna M., *Sixth Assessment of the Science, Engineering, and Math Infrastructure at Three Universities in Kansas*, IPPBR: the University of Kansas, December 1997.

Methodology. Four peer institutions – Arizona State University (ASU), Colorado State University (CSU), the University of Colorado (CU) and the University of Iowa (IU) – were chosen as models for study. The four universities have similar geographic and demographic characteristics to the University of Kansas (KU) and Kansas State University (KSU). Table 1 shows the number of faculty and students at each institution. The number of faculty range from 1,401 at Arizona State to 862 at Kansas State. Arizona State has the largest student population with 42,000 students enrolled in the Fall of 1996. All the other institutions have student populations in the 20,000s.

Table 1
Institutional Data for Selected Research Universities

			SCIENCE AND ENGINEERING		
Institution	**Faculty**[1]	**Students**[2]	**R & D Expenditures**[3] ($ in 1,000)	**Federal Support**[4] ($ in 1,000)	**Graduate Students**[5]
Colorado	1,167	25,109	$ 251,301	$ 197,416	3,508
Iowa	1,024	27,871	178,228	106,516	1,906
Colorado State	939	21,970	126,701	61,751	1,346
Kansas	958	25,108	100,649	49,762	1,694
Arizona State	1,401	42,000	84,653	40,324	2,135
Kansas State	862	20,306	71,222	27,224	1,398

[1] Faculty = AAUP (1997-98). Faculty member must be 100 percent with the university (and at least 50 percent instructional) to be included in this survey.
[2] Students = Fall 1997 Head Count Enrollment, except for Colorado State and Arizona State which are Fall 1996 data.
[3] R & D Expenditures = Total separately budgeted R&D expenditures in the sciences and engineering for FY1996.
[4] Federal Support = Total Federal S & E obligations, FY1996.
[5] Graduate Students = Full-time graduate science and engineering students, Fall 1996.

Source: AAUP (1997-98); Institution Profiles and web sites; Office of Institutional Research and Planning, the University of Kansas; NSF/SRS, Survey of Research and Development Expenditures at Universities and Colleges; NSF/SRS, Survey of Federal S&E Support to Universities, Colleges, and Nonprofit Institutions; and, NSF/SRS, NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering.

Table 1 also illustrates the strength of science and engineering at the institutions based on R&D expenditures, federal support, and graduate students. Colorado ranks the highest of the selected institutions in all three categories (Table 2). Colorado's level of R&D expenditures is around 2.5 times greater than that of the University of Kansas and around 3.5 times greater than that of Kansas State University. The research ratings for these universities vary from a Research 1 Public University classification to a Research 3 Public University classification (see Table 3).[3] Colorado and Iowa are both classified in the Research 1 Public University group.

Table 2
Science and Engineering: Ranks for Selected Research Universities

	RANKS		
	Total R&D Expenditures	**Science & Engineering Obligations**	**Full-time Graduate Students**
Colorado*	21	17	14
Iowa	41	35	43
Colorado State	60	68	74
Kansas*	78	85	52
Arizona State	88	102	37
Kansas State	108	122	68
N=	493	1,638	611

*Includes all campuses.

Source: NSF R&D Expenditures Survey, NSF Federal Support Survey, and NSF-NIH Graduate Student Survey.

[3] Ranks based on Graham's and Diamond's classifications found in *The Rise of American Research Universities* published in 1997 but based on data for 1986-90. This ranking system varies from the Carnegie Commission's rankings; for example, the Carnegie Research I category included 88 institutions in 1994 while Graham's and Diamond's Research I class includes only 55 institutions.

Table 3
Institutional Research Data
for Selected Public Research Universities: 1980-1990

	Research Group	Number of Full-time Faculty[1]	Per Capita R&D[2]	Per Capita Publications[3]
Colorado	1	864	$ 86,613	2.95
Iowa*	1	1,125	66,705	3.75
Colorado State	2	919	37,123	1.59
Kansas	2	929	17,577	1.83
Arizona State	3	1,358	13,016	1.65
Kansas State	3	904	12,758	1.38

*Campus includes medical school.
[1] Faculty = Number of Full-time Instructional Faculty 1987, Department of Education, National Center for Education Statistics. *Please note that the Faculty data listed in Table 1 are for 1997 and from the AAUP; data are not comparable.*
[2] Per Capita R&D = Average Federal R&D Obligations for 1988, 1989, and 1990 ÷ Number of Full-time Instructional Faculty 1987.
[3] Per Capita Publications = Total Publications ÷ Number of Full-time Instructional Faculty 1987.

Source: Appendix B, Table Appendix 9, Table Appendix 11, and Table Appendix 13, *The Rise of American Research Universities* by Hugh Davis Graham and Nancy Diamond, Baltimore: The Johns Hopkins University Press, 1997.

On-site interviews with key administrators and selected faculty responsible for research were conducted in March and April 1998 at the four institutions. Those interviewed included the top research administrator, the administrator of the grants services (pre-award and/or post-award) office, and those responsible for research at the college or school level for Engineering and Arts and Sciences, such as deans or associate deans for research. These interviews provided information on

- organizational structure for research,
- grant services — pre-award and post-award,
- incentives/rewards, and
- strategies and keys to success.

The following report is based on the information gathered during those on-site visits, which include the interviews as well as institutional publications.

Organizational Structure

Each university has a central administrative unit that is responsible for research and which reports directly to the head of the university (chancellor, president or provost). The name of the unit varies, but what is important is that the unit exists. At ASU (Vice Provost for Research) the research unit is responsible for overall research and grant activity as well as providing strategic direction with regards to research. This unit is also involved with brokering collaborative research grant proposals. The research unit's duties at CU (Vice Chancellor for Research) include assisting faculty in obtaining grants as well as the administration of grants. The vice chancellor also takes a proactive approach to funding and actively seeks groups of faculty to submit proposals for major RFPs. At CSU and IU, the office of Vice President for Research has the overall research responsibility. At CSU this office is responsible for all pre-award and financial services associated with grants. The research goals for IU include

Responsible at the University Level

- Vice Provost for Research
- Vice Chancellor for Research
- Vice President for Research

- formulating research policies and procedures,
- providing support for the conduct of research, and
- facilitating research development and technology transfer.

The universities are also involved with the management of their intellectual property and the transfer of technology. They either have an office dedicated to this or have set up a research foundation to handle these matters. The CSU Research

Foundation acquires assets, loans money, finances equipment purchases, handles patents and licensing of technology, and pays royalties to faculty.[4]

Either individual faculty or teams of faculty throughout the university initiate grant activity. Emerging patterns of success with grant activity are:

1. top level support for grants;
2. chief administrator fosters collaborative relationships for research within the university;
3. the existence of centers that formalize relationships; and,
4. assistance with providing matching research funds requirements.

Those universities that are successful with research have a proactive university-level administrator, such as the vice chancellor, who not only articulates the importance of grants but also facilitates collaborative proposals. This administrator engages in deliberate attempts to shape the culture of the institutions by stressing the importance of grants and by inviting teams of faculty to submit interdisciplinary proposals.

Fostering collaborative relationships includes encouraging large-scale, interdisciplinary projects as well as collaboration between the central administration and deans. It is recognized that deans are critical for research and grant activity. Their involvement is sought through cost-sharing arrangements for such items as start-up packages and equipment. The top administration also involves the deans through the return of indirect costs to their units.

The existence of centers formalizes collaboration. Successful universities have set-up centers in areas where they have or wish to develop strength, and these are increasingly interdisciplinary in nature.

[4] March 16, 1998 interview with the Assistant Vice President for Research, Colorado State University.

Finally, successful universities provide assistance with matching requirements for grants. At the University of Colorado, for example, the policy is to provide a larger match than is required in order to signal to the funding agency that the university is committed and that the grant is a high priority.

Grant Services

Under the central administrative unit is an office that provides grant services to all faculty and staff at the university. Once again, the name of the office and the title of the administrative person may vary, but what is important is that an office exists that has clear responsibility for grants, a well-defined mission, and access to the top administrator for the university (chancellor or president). The emerging role for this office is to facilitate large, collaborative grant proposals by teams of faculty across disciplines. This makes the university more competitive in the external research arena.

Grant Service Offices

- Office of Research and Creative Activities
- Office of Contracts and Grants
- Office of Sponsored Programs
- Division of Sponsored Programs

Services vary and include pre-award and post-award services. Pre-award services are those services provided to assist a faculty member with submitting a grant; post-award services are those services associated with the grant once it is awarded, such as regulatory compliance, financial accounting, and troubleshooting with the funding agency.

Staff size at the grant office ranges from 15 to 30 people. Offices at IU and CSU have staff members that specialize in certain funding agencies. At ASU, seventeen staff members are located in eight sites on campus to facilitate faculty access to grant administrators.

Grant offices have two ways of viewing their role – service or compliance. The universities that have been more successful with grant submissions are those that are service-oriented while still insuring regulatory compliance. All the university grant offices interviewed said that they have a strong emphasis on service and say that they will do "whatever it takes" to get the grant proposal out the door. However, the perception of the faculty does not always coincide with this. It is not easy to change the culture from merely signing the proposal and telling faculty members what they did wrong, to saying "what can we do for you to help you get that grant." One university emphasized that the key to having a customer-service orientation is to have the right people in these jobs and indicated that the desired level of customer service was not achieved until staff was changed.

Role of the Grant Office: Service and Compliance

Do "whatever it takes" to get the proposal out the door.

Services can be divided into core services and innovative/special services. Core services include information dissemination, travel to visit agencies, grant writing assistance (which includes budget assistance and seminars), contract negotiations, and regulatory compliance.

Core Grant Services

- Information dissemination (database searches – free and subscription, newsletters, e-mail notifications)
- Agency contacts (travel funds for visits, university lobbyist in Washington, D.C.)
- Grant writing assistance (seminars, editing, budget assistance – review, prepare, approve)
- Contract negotiations (institutional matches, indirect costs)
- Regulatory compliance

Some universities are finding innovative ways to provide grant services to faculty and staff through specialization in funding agencies, disciplines, and research projects. At CSU, one person does all pre-award and post-award functions for a project. That

person is the internal and external contact for that particular project. The goal is to get accounting staff out of the regulatory mode and into the service mode. Rather than accounting services being provided by the accounting or finance office of the university, financial services for a research project are provided through one office.

IU has nine staff members in central administration that are the resource for various disciplines and agencies, including physical science and engineering, health sciences, international programs, pharmaceutical contracts, basic sciences and mathematics, and arts and humanities.[5] ASU takes this a step further and has staff located in academic units throughout the university. Site offices are in Fine Arts, Social Work, Architecture, Engineering (2), and Science (2).[6]

Innovative Grant Services

- Grant coordinators / administrators located in academic units
- Grant coordinators that provide both pre- and post-award services for a project
- Financial services located in research unit and not in accounting unit
- Non-competitive travel funds for agency visits
- Coordinate / facilitate interdisciplinary proposals

Another innovative service is to coordinate and/or facilitate interdisciplinary projects. The research administration is taking a proactive approach and solicits groups of faculty to apply for certain research projects. The research office staff do not wait for faculty to come to them with an interdisciplinary project – they go to the faculty with a project idea that builds on the university's strengths and broker the interdisciplinary proposal.

Travel funds are limited at most universities and distributed on a competitive basis. At ASU, a visit by the principal investigator (P.I.) to the prospective funding

[5] Division of Sponsored Programs, the University of Iowa, listing of staff members in the division, 1998.
[6] March 12, 1998 interview with the Associate Vice Provost of Research, Arizona State University.

agency is viewed as essential and a large travel budget is available for that purpose. Faculty who wish to make use of the Research Incentive Award (RIA) program must first make a personal visit to the target sponsor to discuss with staff the project or program for which a proposal (the basis of an RIA request) will be submitted to that potential sponsor. The TRIPS (Travel of Research Investigators to Potential Sponsors) program is available to provide support for such trips. The TRIPS program is viewed as very successful with more than 70 percent of the faculty who made trips receiving funding for the first time.[7]

The Role of the Academic Units and Deans. Grant activity is the responsibility of the academic units as well as the central administrative unit. Academic units are involved in grant activity through key administrators. Grant and research assistance is available at the college or school level through the deans, associates deans, department administrators, grants administrators, and/or grant offices. The involvement with research and grant services varies and ranges from signing the proposal to providing matching funds to facilitating interdisciplinary proposals.

Services at the College Level

- Sign proposal
- Assist faculty with interdisciplinary proposals
- Budget assistance
- Workshops on grant writing
- Matching funds (equipment, staff)
- Works with university's grants office
- Grants administrator/coordinator
- Financial/accounting services

Funding for services is usually provided from recovery of indirect costs to the college or school. The amount and kinds of services offered depends on the amount of indirect cost funds returned. It is important that the deans provide some kind of funding to grant proposals to show that they are serious about the project. Through the level of

[7] March 12, 1998 interview with the Associate Vice Provost of Research, Arizona State University.

funding support for a project, the academic unit makes its priorities clear to those inside and outside the unit. Also, by sharing in the funding of the project, the academic unit has an interest in ensuring a successful outcome for the project. The academic units at the University of Kansas appear to be less involved in project funding than units at the other universities studied.

Incentives

Incentives

- Overhead, indirect cost recovery funds
- Merit salary raises
- Promotion and tenure
- Equipment matches
- Start-up packages
- Travel funds
- Support graduate students

To encourage research, universities offer a wide range of incentives to faculty. Funds derived from research overhead, or indirect cost recovery (IRC), support various incentives, such as equipment matches, start-up packages for new faculty, seed capital, bridge funding, travel, and grant support services. The amount of overhead returned to the faculty does not seem to be an important incentive to faculty, who see little of what may be returned to their departments. The IRC charged by universities ranged from 45 percent to 52.5 percent. The amount kept by the central research office varied from 10 percent to 98 percent.

More important to faculty is how external research funds are tied to promotion and tenure, salaries, equipment, and graduate student support. Without external funding, it is almost impossible to conduct research, particularly in the sciences and engineering.

A faculty member must show the ability to have sustained research in order to get promoted and tenured. Research capabilities also affect salary with the more active

research faculty being the better paid faculty. External research funds allow faculty to buy time off from teaching or pay for summer salary, thereby increasing annual pay.

Table 4
Priority Areas for Research
at Selected Universities

University	Examples of Priority Areas — Centers/Institutes/Programs
Colorado	Seven Institutes: Institute for Behavioral Genetics (IBG), Institute for Behavioral Science (IBS), Institute of Cognitive Science (ICS), Cooperative Institute for Research in Environmental Sciences (CIRES), Institute of Arctic and Alpine Research (INSTAAR), Laboratory for Atmospheric and Space Physics (LASP), and Joint Institute for Laboratory Astrophysics (JILA)
Colorado State	14 Programs of Research and Scholarly Excellence: *in Biotechnology and Biosciences* – Animal Reproduction and Biotechnology Laboratory, Program in Biochemistry and Molecular Biology, Program in Neuronal Growth and Development *in Human and Animal Health* – Infectious Diseases Program, Meat Science, Radiological Sciences and Cancer Research Environmental *in Environmental and Ecological Sciences* – Department of Atmospheric Science, Natural Resource Ecology Laboratory, Center for Environmental Toxicology and Technology *in Social Sciences* – Tri-Ethnic Center for Prevention Research, Center for Research on Writing and Communication *in Physical and Engineering Sciences* – Department of Chemistry, Optoelectronic Computing Systems Center, Water Resources Research

Source: *Research and Creative Work at the University of Colorado at Boulder*, Office of Contracts and Grants, CU-Boulder Publications and Marketing, undated; and *Institutional Profile: Colorado State University*, Office of Budgets and Institutional Analysis, Fall 1997.

Internal research funds are available at all the universities interviewed. These funds provide seed funding on projects and are competitive university-wide. They support research with the understanding that the recipient will seek external funds. The P.I. cannot re-tap the fund if outside funding has not been awarded. It is clear that internal research funds are not viewed as a way of supporting research for faculty who do not seek external grants. The amount of internal grants ranged from $2,500 to $10,000. Internal funds are also available at several universities for bridging until external funds can be re-secured.

Strategies and Keys to Success

Each university has engaged in some kind of strategic assessment, whether formal or informal, and has established priorities around its areas of strength. Examples of areas of strength for Colorado and Colorado State are listed in Table 4. Universities are not just identifying areas of strength but are identifying *unique* areas of research strength and are forming strategic partnerships to improve research grant proposals in other areas. For example, the Electrical and Computer Engineering department at the University of Iowa is working with Pediatrics and Neurology at IU's Medical Center to conduct gene-mapping research. Such an approach helps the university to avoid thinking too small. These strategic partnerships require the support of top research officials within the university to succeed.

Universities are also recognizing the competitive advantage of institutes and centers when applying for grants. These institutes and centers facilitate collaborative or interdisciplinary projects, which have a competitive advantage when seeking large grants. Faculty may not recognize the right aspiration level for research funding. Centers and

institutes provide opportunities for entrepreneurial faculty and encourage faculty to seek out more and larger grants.

Strategies discussed during the interviews include:

- Identify areas of strength and target those areas for research through preferential hiring and resource allocations;
- Assemble groups of faculty to collaborate in order to be more competitive on large grants;
- Establish Institutes to conduct external research;
- Implement a hiring policy that is not based solely on teaching needs but also takes into account research needs;
- Support the creation of Centers;
- Focus on interdisciplinary teams and put successful individuals on the teams to mentor others;
- Establish interdisciplinary programs to facilitate research training for graduate students;
- Provide seed capital (internal research funds) to projects – start-up costs to illustrate the university's commitment to the research project; and,
- Provide more than the minimum match requirement to signal to funding agency that the university is interested and committed to that area.

The interviews with administrators and faculty also revealed various inter-related keys to success. The first key is the notion of faculty as entrepreneurs; this involves hiring faculty who have a successful grant track record or hiring new Ph.D.s that have an orientation toward grants. Those faculty who act as entrepreneurs and identify funding sources are recognized and supported by their university.

To be successful in securing outside research funds, it is critical that a culture exists in which faculty view their jobs as including applying for research grants as well as

teaching. It is understood that research is part of the job. The culture of research is reinforced by ongoing, regular statements by top administrators, particularly by the Chancellor or President. At one university interviewed, the Chancellor is reported to indicate support for research grant activity every time he speaks to a group of faculty. This constant reinforcement is part of an overall strategy to instill research grant activity into the university culture.

Keys to Success

- Entrepreneurial faculty
- Culture
- Partnerships among departments, colleges, and central research administration
- Institutes and Centers
- Interdisciplinary research
- Top down approach
- Grant activity is part of strategic planning—research strengths are identified and targeted
- Grants viewed as necessary to fulfill university's mission
- Maintain personal contact with agencies
- Location of a medical school on campus
- Providing seed capital to research projects

The notion of a research culture also includes top administration support for Institutes and Centers, which, as previously mentioned, are instrumental in getting the big awards. Interdisciplinary research gains visibility for the project and allows for a sharing of resources to complete the projects. Interdisciplinary projects also allow for the forming of strategic partnerships that accentuate the unique research strengths of the university. An excellent example is the Central Arizona – Phoenix (CAP) Long-Term Ecological Research (LTER) Project through the Center for Environmental Studies at ASU. CAP LTER will involve about 50 faculty from 14 departments and six colleges and will investigate the relationship between land-use decisions and ecological consequences in an urban environment.[8] Another example is the Iowa Spine Research

[8] Central Arizona – Phoenix Long-Term Ecological Research Project brochure, the Center for Environmental Studies, Arizona State University; and March 12, 1998 interview with the Associate Vice Provost of Research, Arizona State University.

Center—a strategic partnership between IU's Medical Center and the Biomedical Engineering Department in the College of Engineering. CU's Joint Center for Entrepreneurship is a partnership between the Colleges of Business and Administration and Engineering and Applied Science and works to strengthen CU's innovation and entrepreneurial climate.

The forming of informal partnerships among departments, colleges, and the central administration on research-related activity is another key to success. It is important that all these groups contribute to a project by providing funds, such as matching, equipment, and/or start-up. By asking an academic unit to attach funds to a project, it forces the unit to clarify its priorities—the level of funding provided by the various units shows just how serious the unit is about the project. Partnerships also allow for the leveraging of resources. Partnerships enhance communication among all the units involved in research at the university and ensure that communications on priorities are continuous. Communication should be enhanced between departments, colleges, and the top research administrators.

Top administration support for research is critical to a successful research program and should include not only top research administrators but also top academic unit administrators, such as deans. In the formation of strategic partnerships it is important that deans have an active and direct role in research grant activity. One way to ensure a dean's involvement is to make him/her part of funding the partnership through equipment or other matching grants. At most of the universities interviewed, part of the indirect costs from grants are returned to the dean—this is intended to make sure that the dean has an interest in grant activity and is a player in securing outside research funds.

The top down approach goes back to that notion of culture. It is important that the top administration makes it clear that grants are an expectation and that the colleges are to deliver. Colleges are told that the expectation is that faculty will secure sufficient grants to fund their research programs. Some colleges will target an area by bringing in senior faculty with a strong grant record.

It is also important that some strategic planning be conducted to identify strengths and establish priorities. Grants need to be viewed as part of the university, not as an add-on. Travel for visits to funding agencies and to attend professional society meetings is critical for maintaining personal contact with agencies. Providing seed capital for research projects helps to establish research in new areas as well as signaling university interest and commitment to that area.

Conclusions

Influences on Research

Tangible — geography, structure, and medical mission

Intangible — institutional history, campus culture, and academic leadership

In the book, *The Rise of American Research Universities,* Graham and Diamond cited various factors associated with high power research facilities.[9] Those factors dealt with a number of issues raised during our interview process — location of a medical center on campus, numerous organized research units, lighter teaching responsibilities, and a promotion and tenure system that rewards research. Graham and Diamond also discussed the importance of younger faculty members who have been trained at leading public and private universities with the values of an academic research culture. For those

[9] Graham, Hugh Davis and Nancy Diamond, *The Rise of American Research Universities: Elites and Challengers in the Postwar Era,* Baltimore: Johns Hopkins University Press, 1997, p. 163.

universities classified as first tier research institutions compared to the second tier research institutions, Graham and Diamond found the following tangible differences — geography, structure, and medical mission. Intangible differences between the two groups were institutional history, campus culture, and academic leadership.

In the Report of the AAAS External Review Team on Research Competitiveness in the State of Kansas,[10] several recommendations were made to strengthen research at Kansas' universities. They included, but were not limited to, the strengthening of working linkages among the three major research universities, support for the acquisition of critical research equipment and facilities, and support for promising young faculty. The committee also recommended the provision of resources that help faculty strengthen ties to national research and funding networks, such as travel funds for national meetings, funding exploration, or collaboration with key researchers in important areas.

Recommendations for Kansas

- Strength linkages among the universities
- Support acquisition of equipment and facilities
- Support promising young faculty
- Provide resources to strengthen ties to national network

The EPSCoR interviews also discussed areas of concern and improvement. A concern arose about the decline in federal funding for research and development. With the level or flattening of federal dollars comes a replacement of public funding with private foundation funding. Administrators also talked about working three times harder to get half as many

Areas of Concern

- Decline in Federal R&D Funds
- Trend for Larger, Collaborative Projects
- Start-up Costs for New Faculty

[10] Based on site visits in July and October, 1997, by the AAAS External Review Team Committee.

proposals funded. The trend is for larger, collaborative projects, which require more work to get coordinated. To be competitive for these larger grants, the university must show its commitment and interest in the proposal through equipment and other matches. To improve grant funding, the trend is to hire young, enthusiastic faculty and give them the resources to establish a research program. Start-up costs for new faculty can be expensive, and it is not uncommon to spend $50,000 to $300,000 for start-ups. ASU officials estimate that the university will spend $5 million next year on start-up packages due to their strategy to hire more science and engineering faculty.[11]

IU's Division of Sponsored Programs listed five areas of improvement that are critical to its future success – laboratory modernization and renovation, equipment match, computer infrastructure, research professorships, and grant support services (proposal development, travel, writing, and editing).[12] These areas are core elements to a successful research program.

Lessons Learned

- Research Culture
- Proactive Leadership
- Entrepreneurial Faculty
- Partnerships—funding, leadership and research

Lessons can be learned about what works and what does not work by looking at how other universities organize, finance, and support the mission of research. One thing is quite obvious, it takes a culture that recognizes the importance of research and knows that leadership needs to be proactive in facilitating research efforts. Partnerships for funding, leadership, and research along with an entrepeneurial faculty and a research culture are key elements to a successful university research program.

[11] March 12, 1998 interview with the Associate Vice Provost of Research, Arizona State University.
[12] March 27, 1998 interview with the Director of the Division of Sponsored Programs, University of Iowa.