

MEMORANDUM

To: Board of Regents
From: Board Office
Subject: Governance Report on Technology Transfer and Economic Development
Date: November 6, 2000

Recommended Action:

Receive the reports on technology transfer and economic development from the University of Iowa, Iowa State University, and the University of Northern Iowa.

Executive Summary:

The Regent universities are required by law to prepare annual comprehensive reports regarding their technology transfer and economic development activities. The reports, included as Attachments I, II, and III, describe the specific goals, objectives, and actions which the three universities completed in 1999-2000.

Each report provides examples of the university's implementation of its strategic plan, consistent with the Board of Regents' strategic plan. For example, Action Step 1.1.4.1 ("each university enhances its research efforts consistent with its mission") and Action Step 1.1.4.2 ("each university increases sponsored research consistent with its mission") reflect the commitment to partnerships with business and industry. Some of the projects described in the three reports carry out Action Step 1.1.4.3 ("each institution increases service to lowans, nation, and world"). Finally, the reports reflect collaborative efforts with a range of public and private sector groups consistent with Action Step 2.2.1.2 ("explore collaboration with business, industry, Workforce Development, and other agencies and organizations and prepare a report with recommendations").

The institutions' technology transfer and economic development activities relate to specific performance indicators established by the Board: Number of intellectual property disclosures (for all three universities); number of new technologies licensed (Iowa State University); and number of new licenses generating revenues and total revenues (Iowa State University).

The universities report advances in many activities associated with technology transfer and short-term declines in a few other areas. The five-year trend in all areas shows a decided upward movement. The performance of the research parks and incubators at SUI and ISU remains robust. The universities reported a total of 967 corporate-sponsored research contracts, compared to 1,086 in FY 1999 and 976 in FY 1998. The dollar amount of these corporate-sponsored research projects totaled \$49.7 million, compared with \$62.4 million in FY 1999, and \$44.7 million the previous year. The universities reported 198 disclosures of intellectual properties in FY 2000, compared to 244 in FY 1999. The number of patents filed in FY 2000 was 143, compared to 175 the previous year. The number of patents issued in FY 2000 was 83, compared with 76 in FY 1999.

Background:

Iowa law requires annual reports of the three universities on technology transfer and economic development to be submitted to the executive and legislative branches of state government. The law is consistent with the Board's responsibility to be fiscally accountable for state funds received by the Regent institutions.

Another report, detailing research inventories at the three universities, is currently in the process of preparation for presentation to the Board. The Board Office is working with the universities to develop more information that can be shared with the Board and others relative to technology transfer and economic development.

The University of Iowa

The activities described in the University of Iowa's report are linked to two goals in its strategic plan, *Achieving Distinction: 2000*. The first is Goal 4, "(conduct) the best possible research and scholarship," and the second is Goal 6, "(develop) strong ties between the University and external constituencies."

In FY 2000, the total dollar amount of external support was \$252.6 million. Corporate-sponsored research in FY 2000 was \$33.1 million, 13.1 percent of the total dollars of external research support. The five-year total of industrial research support is \$154.3 million. The number of corporate-sponsored research agreements in FY 2000 remained in the same range as the previous two years -- 365 in FY 2000 compared to 371 in FY 1999 and 349 in FY 1998. Over the past five years, SUI has successfully negotiated 1,781 corporate research agreements.

The University of Iowa Research Foundation (UIRF) maintained a high level of activity during FY 2000. The UIRF received 84 invention disclosures (79 in FY 1999), filed 83 patent applications (87 in FY 1999), reported a record high 37 issued patents (33 in FY 1999), executed a record high 27 licensing agreements (21 in FY 1999), and earned a record high \$5,067,469 in royalty/license fee

income. The SUI report, Appendix I, contains a number of additional details, including five-year trend data.

The Technology Innovation Center (TIC) accepted five new tenant firms and successfully graduated three companies. Currently, 17 tenants occupy 100 percent of available laboratory space and approximately 75 percent of available office space. To address a shortage of flexible wet lab space for start-up biotech companies, SUI has committed institutional funds to construct a building shell. The Iowa Department of Economic Development accepted the Oakdale Research Park (ORP) as recipient of a \$500,000 Advanced Research Commercialization (ARC) award that will be used to build laboratory space for the TIC incubator. The College of Medicine and the Center for Biocatalysis and Bioprocessing (CBB) continued to provide short-time assignment of lab space for three biotech start-ups. Two TIC companies successfully "graduated" from the incubator to expanded facilities on the ORP, while a third TIC "graduate" expanded in Cedar Rapids.

In FY 2000, the CBB continued technology development for industrial licensing and use on a series of patents donated to the University of Iowa Research Foundation by DuPont in FY 1999. The intellectual property involves a recombinant yeast that produces an enzyme commonly found in spinach. This research is important to the process of production of specialty chemicals, pharmaceutical intermediates, and food ingredients.

The Research Park at the University of Iowa emphasizes such fields as pharmaceuticals, industrial biotechnology, health and medical sciences, and computer simulation of complex systems. University "anchor labs" in those four fields are located on or near the Park.

In FY 2000, SUI began a major new addition to the Multi-Tenant Facility on the ORP. The addition will provide corporate-funded research space for a portion of the UI ophthalmology research program, as well as laboratories for start-up biotech companies in the TIC business incubator. In the privately-owned Myriad Technology Plaza complex, Albany Molecular Research, Inc., committed more than \$3 million to convert an office building to a wet laboratory facility.

Two new buildings were added in FY 1999. Last year, research staff of the National Advanced Driving Simulator (NADS) moved to its completed building. Research staff members of NADS have begun working through a detailed checklist of systems and equipment prior to placing the NADS in operation.

The Technology Innovation Center (TIC) added five new tenants and successfully "graduated" three tenant companies in FY 2000. The 17 TIC tenant firms and 15 expanded "graduate" firms have attracted private capital more than 20 times the State of Iowa's investment in TIC since it was established in 1984.

Examples of new and continuing technology transfer and economic development activities at the University of Iowa include:

- The CMV Promoter for Increased Protein Expression resulted from a discovery in the laboratory of Mark F. Stinski, professor of microbiology, during Professor Stinski's study of gene regulation mechanisms in the CMV virus. The inventions were patented by the URIF. Over a period of 15 years, this discovery has become a very widely used research tool in the biotechnology industry. The "CMV Promoter" has also gained importance in the commercial setting to manufacture bioengineered drugs. Some of these new drugs have been granted FDA approval and are currently being used as therapies to treat patients with cancer and other diseases. The UIRF has thus far negotiated licensing agreements, on a non-exclusive basis by fields of use, to more than 45 industrial partners including several new licensees in FY 2000.
- When appropriate, UIRF participates in creating spin-off companies by licensing inventions resulting from research in UI laboratories to new firms. One example is the Quorum Sciences, Inc. firm, which won \$1 million in research support from the Cystic Fibrosis Foundation. The award will fund the development of a new antibacterial treatment for the leading cause of chronic lung infections.
- The Center for Advanced Drug Development (CADD) offers non-production services relevant to the clinical trials process. CADD worked on 27 projects in FY 2000. Clients include large and small pharmaceutical companies in the United States and overseas, governmental agencies, and medical research centers.
- The University has a five-year research agreement with EnzyMed Division/AMRI. Under this agreement, SUI researchers are working on new compounds or on biological targets for drugs. The company has been able to generate large libraries of chemically related compounds. A \$460,000 Advanced Research and Commercialization (ARC) award from the Iowa Department of Economic Development is funding several collaborations.
- Breakthrough to Literacy, Inc., is a company that has graduated from the SUI business incubator. It initially focused on developing assistive technology for persons with disabilities, but eventually concentrated on helping young children to read. Breakthrough materials are now used in 39 states, in 4,167 classrooms serving 89,340 children. In September 2000, Breakthrough was acquired by McGraw-Hill, Inc.
- Digital Artefacts, L.L.C., is an information visualization company established in FY 2000 to provide computer real-time graphics and simulation solutions to emerging non-traditional markets. For example, it is working with the History

Center of Cedar Rapids to develop an interactive simulation that enables users to "explore" downtown Cedar Rapids as it looked in 1900.

- In the past two years, the CBB has helped more than 60 companies develop new products and refine manufacturing processes.
- NADS, jointly with the VRAC (Virtual Reality Applications Center) at ISU, is pursuing support for advanced simulator networking research for vehicle and equipment distributed product design, with such corporations as Deere & Company.
- SUI staff worked with various communities on attracting new businesses to the state. For example, ORP and TIC worked with Coralville, Iowa Area Development Group, and the Iowa Department of Economic Development to submit proposals to four biopharmaceutical firms seeking locations for research and production facilities.

Iowa State University

The report is organized according to ISU's current strategic plan, which has three goals that relate to technology transfer and economic development. The first is its research mission, the second is extension and outreach, and the third addresses the university's role in economic development. The University has had as a theme this year, "Strengthening Families." To reflect that theme, this year's report contained a number of examples illustrating how family and community life could be enhanced through technology transfer and economic development activities.

In FY 2000, businesses (including commodity groups) funded 556 research projects at ISU. The number declined from FY 1999, when 712 projects were funded, and FY 1998 when 623 were supported by businesses. The dollar amount in FY 2000 is \$15.2 million, below the record \$22.7 million in FY 1999 and \$15.9 million in FY 1998. In addition, businesses funded 79 non-research projects totaling \$9.7 million. In FY 1999, the comparative numbers were 97 non-research projects totaling \$9.8 million. In FY 2000, ISU researchers disclosed 114 new inventions to the Iowa State University Research Foundation (ISURF), and 41 new patents were issued to ISU inventors. In FY 1999, comparative figures were 160 disclosures of new inventions and 48 new patents issued. In FY 1998, the numbers were 158 disclosures and 54 patents issued. The ISU Research Foundation signed 229 new licenses and options for ISU technology, including those for plant germplasm (compared to 323 in FY 1999 and 191 in FY 1998). Thirty-five technologies were licensed for the first time in FY 2000. ISU researchers received one R & D award in FY 2000, bringing the total R&D 100 awards received by ISU since 1984 to 22, second among all universities in the United States.

The Iowa State University Research Park added 13 new companies and affiliates in FY 2000. The total number of companies that have used the Park facilities is 109. Of these, 29 companies employing over 348 people have left the Park to expand or locate elsewhere. Twenty-three of those stayed in Iowa. Currently, 46 companies and centers are located in or affiliated with the Research Park. The companies in the Park employ nearly 900 people.

Examples of technology transfer and economic development activities at Iowa State University include:

- Howe Hall's atrium is now the site of the world's state-of-the-art, next generation virtual reality (VR) interface. The C6 is a three-dimensional, full-immersion, synthetic environment, including a room where all four walls, the floor, and the ceiling are projection screens capable of totally immersing a subject in a projected image. Examples of use include "walking" inside buildings that no longer exist, getting close-up views of severe weather conditions, and inspecting operating industrial furnaces.
- Researchers at ISU helped an Iowa company that manufactures tools that aid tire changing on large equipment (i.e., dump trucks, end loaders, etc.) in testing the load capacity of these tools. Their work resulted in a redesign of a part and assembly line changes, improving the safety of the equipment.
- In order to increase the use of crash data in the planning of roadway modification, the Iowa Department of Transportation contracted with the Center for Transportation Research and Education (CTRE) to develop a mapping enhancement to the Accident Location and Analysis System (ALAS). This research will make it much more likely that a poorly functioning location, such as an intersection, will be corrected prior to the occurrence of numerous crashes.
- Fresh fruit juices, especially unpasteurized apple cider, have been the sources of significant food poisoning outbreaks recently. Food Science and Human Nutrition faculty have worked with Iowa cider producers to improve the safety and quality of apple cider produced in the state.
- 27,347 bushels of specialty soybean germplasm developed at ISU were planted in Iowa, generating \$66,834 in royalties.
- A west central Iowa company manufacturing architectural doors wished to use the sawdust picked up by their dust collection system for heating its plant and for bedding for livestock. However, there was a chance that lead used in their manufacturing process might contaminate the sawdust and prohibit its use in these two ways. The Iowa Companies Assistance Program (ICAP) at ISU analyzed the sawdust and found it contained extremely low to zero levels

of lead contamination, helping the company to save over \$80,000 in heating costs per year.

- An east central Iowa company with approximately 200 employees had a customer identify a possible microstructural problem in a die casting. ICAP personnel and a Center for Industrial Research and Service (CIRAS) staff member assisted the company in analyzing the problem and improving the manufacturing process. The company experienced a 25% increase in output.
- The Center for Transportation Research and Education (CTRE) employs graduate students as research assistants to work on transportation-related projects. In a recent follow-up survey of 220 master's level students who had worked at CTRE since 1993, approximately 25 percent of the students indicated they had taken their first post-college job in Iowa.
- The Research Institute for Studies in Education (RISE) assisted in the evaluation of a community-based Precision Agriculture Education Network, which prepares students to use technology more effectively in agriculture and to fill jobs in the new economy.

The University of Northern Iowa

The University of Northern Iowa provides economic development and business assistance services to businesses and citizens, thereby enhancing the state's economic and social interests. The University's efforts are consistent with Goal 4 of its strategic plan, "external relations: Develop appreciation and support for the values, programs, and services of the university." UNI outreach programs focus on helping businesses and communities understand and apply the technology and intellectual properties developed by Regent universities and the private sector.

During the past year, UNI completed 46 business-funded research projects. This represents a 31 percent increase in corporate-sponsored research from FY 1999. In addition, hands-on technical assistance was provided to more than 1,200 Iowa businesses and 390 communities. To provide these services, UNI obtained more than \$5.7 million in federal, state, and business-derived funding. In addition, UNI has hired part-time staff to expand its efforts in promoting and facilitating intellectual property development and patent applications. During FY 2000, five patents were received, which is the second highest number since the University formed an intellectual properties policy.

Examples of technology transfer and economic development activities at the University of Northern Iowa include:

- The Iowa Waste Reduction Center (IWRC) continues to be an excellent return on investment for the State of Iowa and its small businesses. In its 11 years

since inception, the IWRC has worked with 2,000 small businesses to assess environmental compliance and outline options for waste reduction.

- The Center for Energy and Environmental Education (CEEE) provides outreach to public, educational, and civic institutions, as well as businesses, on energy efficiency. In FY 2000, CEEE organized 20 projects. The Center received an Iowa Department of Natural Resources Energy Leadership Award in 1999.
- In June of 2000, Ag-based Industrial Lubricants (ABIL) began a testing program in conjunction with Iowa State University's Department of Food Science and Human Nutrition. The program involved testing a new anti-oxidant developed by ISU, which is used with industrial lubricants.
- ABIL has formed a private corporation to more effectively market the use of soybean-based industrial lubricants. An exclusive agreement has been signed with DuPont to become the sole marketer of its hioleic (GMO) soybean oil in conjunction with other corporate partners. This new "virtual" company is an excellent example of how university innovation and invention can be fully commercialized and may become the model for Regent universities in the "new economy."
- CEEE continued to be involved in a project to expand the local food economy. Initiated in 1997, the plan involves analyzing how community-supported agricultural projects can be sold locally. In 1999 alone, local purchases to UNI's food services, an area hospital, a local restaurant, and area processors, was nearly \$130,000. In Summer 2000, the project was expanded to include a cluster of hospitals in north central Iowa.
- Heartland Technologies is a new start-up company located in Oelwein. Through a partnership with Iowa State University, Heartland has developed several soy-based adhesives that will be used in the manufacturing of board products such as plywood, particleboard, and manufactured fiberboard. Strategic Marketing Services (SMS) at UNI will conduct the market research for the soy-based adhesive and the finished board products.
- The Institute for Decision Making (IDM) provided services to 390 community clients, which resulted in part, according to Iowa Workforce Development, in the creation of 3,000 jobs. The number of clients served by IDM has increased significantly since 1988. One example of IDM's collaborations with state agencies is reflected in a \$60,000 special appropriation it received to transfer its laborshed methodology to Iowa Workforce Development.
- The John Pappajohn Entrepreneurial Center (JPEC) provided research, consultation, and services to 40 business and direct financial support to 20 new businesses. Through its support of UNI's Small Business Development

Center (SBDC), JPEC assisted over 500 businesses in such areas as market development, operations, and information technology. The UNI SBDC handled the largest client load of any Iowa SBDC regional office.

Analysis:

As indicated in ISU's report, perhaps the most important technology transfer contribution to Iowa's economic development is technology-literate graduates. The universities also provide technology transfer through technical courses offered for professionals around Iowa and elsewhere. The university research parks continue to provide excellent opportunities for interactions between faculty, staff, and students in applied research fields. Although corporate-sponsored research has been emphasized in this report, the universities also provide economic benefit to Iowans through governmental, civic, and other channels.

The following attachments contain specific information on the topics of technology transfer and economic development described above. The page numbers for each Attachment are included.

- Attachment I University of Iowa, pages 13-49
- Attachment II Iowa State University, pages 50-79
- Attachment III University of Northern Iowa, pages 80-111

Executive Summaries and Highlights

- SUI, Attachment I, pages 13-17
- ISU, Attachment II, pages 50-54
- UNI, Attachment III, pages 82-87

Corporate-Sponsored Research

Over the most recent five-year period, all three universities report an increase in external funding. Corporate-sponsored research is one part of this funding, which ranges from approximately 13 percent at SUI to approximately 50 percent at UNI.

At SUI, where research is predominantly supported by federal funds, corporate-funded research support has grown over the past five years. In FY 2000, SUI reported small declines in total external support and corporate research support from FY 1999. SUI reports important gains in patent filings, patent issuances, and the licensure of patents over the most recent five-year period. A significant increase in earnings from patents follows from this favorable trend. The five-year total of corporate-sponsored research for SUI was \$154.3 million. For FY 2000, it was \$33.1 million, compared to \$39.6 the previous year. The number of agreements in FY 2000 was 365, compared to 371 in FY 1999.

In FY 2000, ISU received \$15.2 million in business and community group research funding, compared to \$22.7 in FY 1999. The number of agreements in FY 2000 was 556, in FY 1999 the total was 712.

The University of Northern Iowa experienced a 31 percent increase in corporate-sponsored research from FY 1999 to FY 2000. In FY 2000 the amount received was \$1.4 million. Forty-six agreements were signed this year, 35 in FY 1999.

For specific information on Corporate-sponsored Research, see:

- SUI, Attachment I, pages 18-34
- ISU, Attachment II, pages 55-60
- UNI, Attachment III, pages 92-97

Intellectual Properties/Licenses/Patents

The number of patents filed and issued for FY 2000 were:

- University of Iowa -- 83 filed, 37 issued
- Iowa State University -- 55 filed, 41 issued
- University of Northern Iowa -- 5 filed, 5 issued.

For specific information on Licenses/Options, Patents, see:

- SUI, Attachment I, pages 23-24, 42-49
- ISU, Attachment II, pages 55-56, 73-74
- UNI, Attachment III, pages 95-99

Research Parks

The research parks at SUI and ISU continue to be productive. First, the universities provide encouragement, expertise, and future employees for the technical companies. Second, the universities benefit from the research and development activities of the companies located at the parks. The number of firms and the number of employees will fluctuate each year, dependent in part upon the number of firms that “graduate.”

UNI is nearing the completion of a Regional Business Center/Incubator (RBC) in downtown Waterloo. The U.S. Economic Development Administration, SBA, UNI College of Business, the John Pappajohn Entrepreneurial Center, and the City of Waterloo are jointly funding the project. The RBC will provide a facility for entrepreneurs to secure technical assistance, specialized training, and access to business technology. Central to the project is the creation of a mixed-use business incubator designed to foster the growth of early stage companies through shared resources, mentoring, and access to technology. The RBC will open in January 2001.

For specific information on the research parks at SUI and ISU, see:

- SUI, Attachment I, pages 13, 15-17, 35-40
- ISU, Attachment II, pages 67-73

Common Data Sets and Performance Indicators

The Board of Regents, in conjunction with the universities, has developed common data sets and performance indicators related to technology transfer and economic development. These will be reported more fully in December 1999. For example, the three universities are required to report on the number of intellectual property disclosures each year.

All Universities

			SUI		ISU		UNI	
22	<i># of intellectual property disclosures</i>	1.1.4.1	93-94	69	93-94	139	93-94	0
			94-95	53	94-95	141	94-95	0
			95-96	74	95-96	155	95-96	1
			96-97	86	96-97	115	96-97	3
			97-98	90	97-98	158	97-98	4
			98-99	79	98-99	160	98-99	5
			99-00	84	99-00	114	99-00	0
			Target	90	Target	NP	Target	NP

Examples of other performance indicators in this field are the number of new technologies licensed, and the number of new licenses generating revenues and total revenues. The following charts contain data compiled only for Iowa State University.

Iowa State University

23	# of new technologies licensed (ISU)	1.1.4.1	<table border="0"> <tr><td>93-94</td><td>50</td></tr> <tr><td>94-95</td><td>42</td></tr> <tr><td>95-96</td><td>48</td></tr> <tr><td>96-97</td><td>57</td></tr> <tr><td>97-98</td><td>70</td></tr> <tr><td>98-99</td><td>55</td></tr> <tr><td>99-00</td><td>35</td></tr> <tr><td>Target</td><td>55</td></tr> </table>	93-94	50	94-95	42	95-96	48	96-97	57	97-98	70	98-99	55	99-00	35	Target	55
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94-95	42																		
95-96	48																		
96-97	57																		
97-98	70																		
98-99	55																		
99-00	35																		
Target	55																		
24	# of new licenses generating revenues and total revenues (ISU) [includes those licenses that generate \$10,000 and greater income]	1.1.4.1	<table border="0"> <tr><td>93-94</td><td>21 for \$0.6 m</td></tr> <tr><td>94-95</td><td>20 for \$0.7 m</td></tr> <tr><td>95-96</td><td>20 for \$1.1 m</td></tr> <tr><td>96-97</td><td>23 for \$1.5 m</td></tr> <tr><td>97-98</td><td>33 for \$2.2 m</td></tr> <tr><td>98-99</td><td>39 for \$2.3 m</td></tr> <tr><td>99-00</td><td>44 for \$1.5 m</td></tr> <tr><td>Target</td><td>30 for \$1.5 m</td></tr> </table>	93-94	21 for \$0.6 m	94-95	20 for \$0.7 m	95-96	20 for \$1.1 m	96-97	23 for \$1.5 m	97-98	33 for \$2.2 m	98-99	39 for \$2.3 m	99-00	44 for \$1.5 m	Target	30 for \$1.5 m
93-94	21 for \$0.6 m																		
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99-00	44 for \$1.5 m																		
Target	30 for \$1.5 m																		

There are several Board of Regent performance indicators related to sponsored research (#18, #20, and #21) and external funding proposals (#19) that include technology transfer initiatives as well as other funding. These will be reported in December 2000 in the Performance Indicators report.


Charles R. Kniker

Approved: 
Frank J. Stork