Association of American Universities

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TRENDS IN TECHNOLOGY TRANSFER AT UNIVERSITIES

REPORT OF THE CLEARINGHOUSE ON UNIVERSITY-INDUSTRY RELATIONS

ASSOCIATION OF AMERICAN UNIVERSITIES

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MEMORANDUM

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This report, "Trends in Technology Transfer at Universities", is the second report of the Association of American Universities' Clearinghouse on University-Industry Relations. The Clearinghouse was established in 1983 with the help of a grant from the Pew Memorial Trust with the purpose of providing all interested parties with information about university policies and practices relating to research collaboration between universities and industry.

The first report of the Clearinghouse, published in February 1985, addressed two issues of concern to universities: faculty conflict of interest, and the delay of publication of research results. That report illustrated how universities have adopted policies and procedures that address these and other related problems that accompany industry-sponsored research agreements.

In selecting a topic for the second report, the Clearinghouse focused on the activities of universities themselves rather than faculty members. In addition to permitting and sometimes facilitating industry-sponsored research, many universities are

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now taking steps to arrange for university-owned inventions to be developed and marketed. In some cases the university itself undertakes the development and marketing of the invention. In others, the university establishes either nonprofit or for-profit entities to perform similar functions.

This report describes the diverse approaches currently being taken by leading research universities, both philosophically and pragmatically, in forming and implementing the role of the university in technology transfer and licensing. All the institutions participating in this survey have given extensive consideration to the risks and benefits of technology transfer activities. As one might expect, the practices of the sampled institutions differ markedly and so do the reasons given for those practices.

The AAU hopes these materials will prove to be informative and useful.

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PART I - EXECUTIVE SUMMARY

This AAU report, Trends in Technology Transfer at Universities, is based on responses to a survey questionnaire in 1985. The questionnaire sought information regarding the technology transfer activities of universities, specifically:

* whether respondents had restructured their internal patent and licensing efforts in order to increase the number of inventions owned and successfully licensed by the university, and if so, the circumstances of the decision to do so and the results of such efforts;

* whether respondents had established an external entity to undertake technology transfer of university-owned inventions, such as a nonprofit foundation or a for-profit company, and if so, the circumstances of the decision to do so and the results of such endeavors.

The survey responses reported widespread changes in internal patent and licensing activities and corresponding increases in the number of invention disclosures provided by faculty to the university. The report explores circumstances that may have contributed to this trend, including:

* changes in federal patent policy relating to universities;
* a new approach to the public service role of universities which encourages technology transfer;
* growth of state economic development programs which provide incentives to universities to link university-

based technology with the business community;

* requests from faculty for aggressive technology transfer capabilities in the university and corresponding financial incentives to faculty for their inventions;
* reduced funds for research from other sources.

With regard to external foundations and companies to provide patent and licensing services and, in some cases, to provide funds or investors for further development and marketing of an invention. the survey results were inconclusive. Two problems with the survey information rendered the results unclear:

* few institutions reported such activities;
* those that did report undertaking such activities did not report the accomplishments and failures of these activities.

The text of the report discusses in depth the discernible trends in university technology transfer and the prospects for the future activities of universities in the commercialization of research results.

PART II - INTRODUCTION

A. Purpose of Report

The purpose of this report is to review the results of the second university survey conducted by the Clearinghouse on University-Industry Relations. The subject matter is the technology transfer activities of universities. The principal focus is the efforts of universities to promote development and marketing of university research results.

The first report of the Clearinghouse, University Policies and Procedures Regarding Conflict of Interest and Delay of Publication (February 1985), was based on university responses to questions regarding two issues growing out of university-industry research relationships: conflict of interest among researchers, and delay of publication of research results. Notwithstanding some differences among universities, the first survey demonstrated remarkable similarities among institutions in establishing policies and procedures regulating faculty conflict of interest and contractual delay of publication.

The first report concluded that there are dynamic forces operating both within and outside the university to encourage cooperation between universities and industry, especially in areas of new technology. Those considerations have directly affected the functions of the university itself, prompting many administrators of major research universities to consider seriously for the first time the proper role of the university

in promoting the successful transfer of its technology from the laboratory to the marketplace.

The responses to the second survey differ dramatically from the first. Major research institutions have diverse policies and procedures concerning the extent of the university's role in the business of developing and marketing inventions. The responses indicate that many of these differences may be attributed to:

* differing philosophical approaches to business relationships;
* inexperience in business matters;
* available resources of the university;
* the cooperation and initiative of state and local governments in promoting innovation and new business;
* the differing interests and concerns of researchers.

These factors, and the responses of the universities surveyed, are the subject of this report.

B. Background

1. Overview

a. Divergent Goals of Universities and Businesses

Universities, like other owners of intellectual property, must protect their inventions. They do so through the federal system of patents or copyrights. If the invention is unsuitable for such protection, an owner of an invention may choose to keep the

property secret, although many universities treat secrecy as an inappropriate practice. Once protected, a university seeks methods for perfecting, marketing, and manufacturing the invention. and eventually licenses it for a financial return. The method most frequently used is to negotiate a license agreement with an interested party who wishes to bring the invention to the marketplace. In exchange for the opportunity to use. manufacture, and sell the invention, the licensee pays royalties to the owner of the invention. Typically, the inventor is entitled to a portion of the royalties from the invention.

Unlike other owners of intellectual property, however, universities have been the object of a controversy concerning their role in promoting development of inventions resulting from university research, especially in "high technology" areas. The goals of entrepreneurs who take business risks to develop products and services for profit differ greatly from the teaching and research goals of universities. These differences are at the heart of the ethical and legal issues surrounding university-industry interaction.

Notwithstanding the considerable differences between the profit-making goals of the private sector and the scholarly and educational goals of universities, the two parties each have resources that are needed by the other. The university can accept the financial support provided by industry and the industrial sponsor can accept the university's concerns for quality and

impartiality in its research. Thus the two can form a respectable and profitable research relationship. Many participants in these relationships, and others in government, believe that university-industry collaboration brings a benefit to both parties, and thereby to progress and innovation in the economy.

b. Additional Factors Pointing Toward Collaboration

Several other factors have contributed to the increasing expectation that universities should assist industry's application of new ideas. Those factors include:

* changes in federal patent laws relating to universities;
* promotion of university-industry interaction by state governments;
* university interest in enhancing the income flow from university-owned inventions;
* the interest of entrepreneurial faculty in opportunities to reap greater financial rewards from their research efforts;
* a greater willingness on the part of industry to adapt to university concerns in order to structure the sponsorship of research and licensing of the results.

Many universities have recently begun to expand their role in the commercialization of research results. Universities evaluate the activities relating to technology transfer by considering issues such as the appropriateness of such activities to the primary mission of the institution and the amount of risk involved in promoting business development and marketing of research results.

Although the universities surveyed have been successful in increasing the technology transferred from the university to the marketplace. few have also been able to become participants in the commercialization of their own technology.

c. Survey Methodology

The information offered and conclusions drawn in this report are based on the responses of institutions to a questionnaire. (The text of the questionnaire appears in Appendix A.) Some institutions invited to participate in the survey chose not to respond. Others answered only some of the questions or offered examples to illustrate an answer. (A list of the universities that responded to the survey appears in Appendix B). Thus the responses are not readily adaptable to standard methods of quantitative data analysis. Therefore, unlike the first report of the Clearinghouse, this report will not offer conclusions based on the percentage or number of universities undertaking certain technology transfer activities. Instead, this report offers a broad discussion of the trends among the universities that did participate in this survey, and sets forth the universities' own examples to provide greater insight into those activities.

2. Role of the Federal Government: Changes in Federal Patent Law

a. Description of the Changes in Federal Patent Law

In 1980, a significant change in the federal patent policy

regarding inventions made with federal assistance was enacted. Public Law 96-517. the Patent and Trademark Amendments of 1980, provided that universities and small businesses could retain patent rights to inventions resulting from research conducted with federal funds.

The purpose of the change in the law was to facilitate the use of government-funded inventions as the basis for commercial products. Until the new law was enacted, only five percent of government-owned inventions had been utilized by business. 1/ Congress was concerned that this low utilization was partly the result of restrictive federal patent policies and the preference for non-exclusive licenses. Such licenses are perceived by entrepreneurs to be necessary to justify the risk and capital investment in development and marketing of inventions. By giving the university clear title to the invention and the financial incentive to promote its development. Congress hoped that research results from federally-funded research would no longer lie dormant. 2/

b. Results of the Change in Law

P.L. 96-517 and subsequent amendments enacted in 1984 (P.L. 98-620), appear to have had the intended result. This new patent policy has further contributed to a change in attitude by both universities and industry concerning cooperation on developing technology. In reporting the 1984 amendments to P.L. 96-517 to the House of Representatives. the Committee on Science and Technology stated:

> "These laws [P.L. 96-517 and P.L. 96-480, The Stevenson-Wydler Act, relating to promoting technological innovation within the government] and other events have made government research officials more sensitive to and more interested in cooperating with the private sector. Universities and small businesses have had incentive to promote inventions made under federal contract and more federal inventions have been the basis of commercial products." 3/

Many respondents to the Clearinghouse survey credit the new Federal patent law with providing the incentive for the university to establish an aggressive patent and licensing program, including the commercialization of inventions resulting from privately supported research. However, other respondents stated that Federal patent policy had no impact upon their patent and licensing efforts. This latter view was shared both by institutions that are pursuing an active program and those that are not.

One explanation for such a discrepancy is that the Federal patent law is only one of several factors that have influenced university decisions on the appropriateness of technology transfer activities.

First, the university may have been encouraged to pursue an aggressive patent and licensing policy because of interest in greater commercialization of research results by faculty researchers. Second, it is also possible that a statewide economic development program involving the university may have increased awareness among administrators concerning the university's patent and licensing efforts. Thirdly, the impetus for an aggressive technology transfer program could have been generated from an administrative office of the university rather

than the office responsible for patent and licensing activities. In some cases, the Office of the President, in examining the relationship between the university and local industrial research, may have brought attention to the university's patent and licensing program.

In spite of these discrepancies. the fact that the Congress changed the Federal patent law to encourage universities to own and market federally-funded research results tends to validate an entrepreneurial approach by the university toward all research results it owns.

3. Role of State Governments: Changes in State and Local Development Efforts

a. General

Many state governments, facing the need to revitalize industry within their boundaries, have turned to universities in the state as centers of innovation and opportunity. The National Governors' Association stated this premise in its report Technology and Growth: State Initiatives in Technological Innovation (October 1983):

> "State governments are critically situated to encourage and facilitate the process of technological innovation...They support the vast majority of the nation's public institutions of higher education where most university research and development take place. They provide significant technical, management and financial assistance to new and existing technology-based firms from which innovations to the marketplace flow. Equally important, state governments are in a position to build the kind of partnerships with education and industry that stimulate innovation and help to ensure its continued vitality and

relevance." 4/

One trend that can be identified from the responses to the survey is that public universities tended to be involved in innovative technology transfer activities as a result of state economic development programs. In addition to state start-up funding for new research centers, the initiative for the university's activities is assumed by the state. In these cases, universities are one component of a state-wide strategy to undertake technology transfer activities.

b. Variations Among State Economic Development Programs

Some states have established cooperative centers among several universities in a single region of the state and require industry participants to provide funding to the center. Other states have grant programs for universities to establish their own programs. The initiative for a program may have come from the legislature, the governor's office or a task force appointed by the governor, or from the state office of economic development. Some programs focus on a single effort or industry, others disperse funds widely. Of course, state universities are an integral part of a state's resources to enhance its economy. In addition, most long-range state programs include the participation of private universities in the state.

c. Usefulness of State Economic Development Programs

The participation of the state government in efforts to promote collaboration between industry and universities is often an

encouragement to both parties. Industry participation is increased by the state's commitment of funds. The university relies on the state as a buffer between it and industry demands. Many respondents to the survey stated that federal and state programs to promote collaborative research activities have also helped increase the number of inventions patented and licensed by the university.

d. Example: New Jersey

One example of a sweeping approach by a state to enhance its own economy is reflected in the Report of the Governor's Commission on Science and Technology for the State of New Jersey (December 1983). The Commission's report sets out four support mechanisms to promote university-industry collaboration in the state. The Commission recommended the establishment of advanced technology centers to support equipment acquisition and research at the state's public and private higher education institutions. Industry would contribute to the centers through affiliates programs, membership fees, matching grants, and in-kind support.

The report also recommended a matching grant program awarded to individual researchers working in emerging technologies with commercial potential and a program of incubator facilities to provide low-cost space to new companies to be selected by the sponsoring university and to be financed by state-backed revenue bonds. Lastly, the Commission proposed a technology extension service, modeled after the Agriculture Extension Service, to accelerate application of new technology to industry.

The New Jersey Commission also selected technological fields to be targeted, and recommended the establishment of a state venture capital fund, new loan programs, and modifications of restrictions on investment and tax benefits of high technology investment. The Report also provided strategies for increased attention to education. training, and job development.

To date, the state has established five advanced technology centers with the help of a $90 million bond issue. The centers include the Center for Ceramics Research at the State University at Rutgers (which began with support from the National Science Foundation), the Hazardous Waste Center at the New Jersey Institute of Technology, and the Center on Biotechnology and Medicine jointly with Rutgers and the University of Medicine and Dentistry of New Jersey. In addition. the state has established a permanent New Jersey Commission on Science and Technology to further implement the report and to support science and technology in the state.

e. Example: Wisconsin

In 1983, the State of Wisconsin established the Technology Development Fund to provide funding for new technology projects. The University of Wisconsin established its Office of Industrial Research and Technology Transfer in that same year. The Office is financed in part by the Fund, and its purpose is to promote, facilitate, and develop cooperative research and development

programs and to guide faculty in their pursuit of commercial development of inventions.

f. Other Examples

Other notable state economic development programs which established centers for research at universities are the Ben Franklin Partnership in Pennsylvania and the North Carolina Biotechnology Center in North Carolina.

4. Role of Universities

The survey responses showed that universities do not have a unified view of their role in technology development and its relationship to business. Most institutions stressed their commitment to education and the transmission of knowledge to the public domain. This principle was clearly stated by the Acting President of the University of Wisconsin in a letter accompanying the response to the survey, in which she stated that technology transfer activities "have been motivated by a sense of our responsibility to communicate knowledge to the broader scientific and technical communities, rather than as a source of additional research funding. Indeed our general experience has been that technology transfer is in this sense an expense rather than an income item." 5/

Other institutions characterize their activities as entrepreneurial. The President of the University of Utah, Chase N. Peterson, refers to that institution's activities as "academic capitalism", and reports that the institution is aggressive in

its role as business facilitator for faculty and other entrepreneurs who wish to utilize the resources of the university to develop businesses from university research results. 6/ The University of Utah frequently takes an equity interest in new ventures to commercialize inventions resulting from research on campus.

As a result of the varying approaches of institutions to technology transfer, the types of activities they have undertaken cover a wide spectrum. Some universities had considered the formation of corporations or other arrangements which required the university to undertake financial risk based on the commercial success or failure of the developed products or services. These institutions have formed new enterprises based upon carefully considered recommendations and a subsequent business plan. Some have rejected such action. Others had not carefully considered such actions, but have rearranged the duties of personnel within the institution to direct more effort into patenting inventions.

Part III - Technology Transfer Conducted From Within the University

A. Background

The activities of a university to protect intellectual property and to market inventions successfully may be conducted by the university itself or on behalf of the university by an entity outside the institution's direct control. In order to determine how much of this activity is conducted inside versus outside, the survey asked respondents to describe their internal operations for patenting and licensing university-owned inventions, including their use of outside patent management firms for evaluating invention disclosures and filing patent applications. The survey asked: Does the university encourage faculty to disclose inventions; upon what basis does the institution distribute royalties; and has the university increased its efforts to promote the institution's patent and licensing program?

B. Results of Survey

1. Establishment of University Patent and Licensing Capability

a. General

Most of the universities responding to the survey have revised their patent policy within the last three years or are presently in the process of so doing. Recent revisions place greater

emphasis on technology transfer. Techniques include identifying a single office within the university to be responsible for negotiating licenses with industry, and providing increased monetary and support services incentives to faculty to encourage invention disclosures. In most cases the revisions were undertaken at the recommendation of an advisory committee appointed by the president or a vice-president of the university consisting of faculty, staff, and administrators and reporting directly back to the president or the board of trustees of the university.

b. Example: University of Washington

For example, in 1981, the University of Washington formed a University Task Force on Technology Transfer to review policies and practices. Among other items, the Task Force recommended new policies to:

* reward faculty for research with commercial potential;
* revise patent policy in light of the federal patent law changes;
* provide greater royalties to the inventor's department for research;
* establish a new office to coordinate ventures with outside firms and the newly established Washington Research Foundation.

Further, the Task Force recommended the establishment of a standing committee to monitor this policy and its implementation.

The university adopted and implemented all of these

recommendations and all patent and licensing matters are now the responsibility of the Office of Technology Transfer.

The University of Washington reported a dramatic increase in the output of their licensing program. In the first half of 1985, the university had received 75 invention disclosures as compared to 25 in each year between 1978 and 1982. The university also reported an increase in the number of licenses and the number of inventions being evaluated for commercial potential.

c. Results of Efforts to Establish University Offices

Every institution that has tried to increase the number of patents and licenses of university inventions has reported an increase in the number of inventions disclosed by faculty and an increase in the number of licenses of inventions successfully negotiated with industry by the university.

In conjunction with the establishment of a separate office within the university to address the university's patent and licensing needs, many universities have set out to increase the visibility of their patent and licensing program. Public relations efforts both inside and outside the university have accompanied a greater emphasis on technology transfer. Many institutions provide new publications directed to industry to advertise the resources of the university and its willingness to engage in negotiations. Some institutions hold seminars for industry representatives to introduce researchers, describe the university's capabilities,

and tour the university's facilities and instrumentation. In some cases these activities are part of an effort by the state to attract new high technology industry.

2. Patent Management Firms

a. General

In 1977. Rensselaer Polytechnic Institute established its current procedures concerning patenting and licensing inventions. The Institute's major reason for changing its procedures was dissatisfaction among faculty with the patent management firm previously engaged by the Institute. As a result, the Institute established a Patent Review Committee consisting of faculty members and administrators. Faculty researchers submit invention disclosures to the Committee. When the Committee determines that an invention has commercial potential, the Institute may patent it or submit it to a patent management firm. If the Institute retains the option to patent the invention, the Office of Grants and Contracts undertakes the task of preparing a patent application. Licensing arrangements are conducted by a patent attorney outside the Institute.

Such efforts demonstrate new uses of patent management firms. In the past, the typical arrangement between a university and a patent management firm had been as follows: the university would send all invention disclosures it received from faculty to the patent management firm for evaluation. The university would not compensate the firm for the evaluation of the invention. The firm would be under no obligation to accept the invention for further

action, but if it did, the firm would receive a major portion of the royalties (as much as half) and the university and the inventor would share the remainder. Royalties would be paid after the firm was compensated for its efforts in patenting and licensing the invention.

b. Decline of Use of Patent Management Firms

The survey responses indicate that there is no longer a standard use of patent management firms among universities. Some institutions conduct patent management activities within the university while others have maintained long established relationships with a particular patent management firm.

The traditional arrangement with a patent management firm has become increasingly unacceptable to many universities because it requires the university to relinquish control of the decision to pursue a patent. Nor are faculty researchers satisfied with the passive role of many patent management firms and the lack of attention given to the development of their inventions. Several universities stated that one reason they abandoned their patent management firm was the dissatisfaction of researchers with their exclusion from the process of evaluating their invention for commercialization.

c. Alternatives to Patent Management Firms

Most of the institutions which have terminated a prior patent management arrangement have now established, as an alternative,

an in-house patent and licensing office or a separate foundation associated with the university to perform the function of evaluating inventions for possible patent protection. The trend toward bringing the patent management function into the university or transferring the function to a foundation is clearly a response to the lack of attention by and control over patent management firms.

Some institutions have negotiated new arrangements with patent management firms to provide for more focused consideration of the university's invention disclosures. This approach is most often used in lieu of establishing an in-house capability for patent management, but several institutions have done both.

i. Example: University of Colorado

For example, the University of Colorado has an agreement with University Patents, Inc. (UPI), which was recently renegotiated to provide for special contingencies. The agreement provides that upon request of the Regents of the University, UPI shall grant a license to a university-owned invention "to a new venture funded in whole or in part either by the Regents, by the Colorado University Foundation, or by any affiliate of either of them..."/7 This provision allows the university to form or support a new company to develop an invention without the direct participation of UPI.

Further, if the Regents obtain a research grant or contract from a for-profit, nongovernmental entity, and such entity receives an

option for other rights from the Regents with respect to future inventions made as a result of such funding, the Regents can exclude UPI from a share of such future inventions. This permits the university to include provisions concerning the development of inventions within a contract directly with an industrial sponsor.

The University of Colorado has established a foundation and a for-profit corporation, (to be discussed further in Part IV), in part because its former arrangement with UPI permitted UPI to accept only a small fraction of the invention disclosures offered by the university for commercialization. The corporation is expected to undertake the risk of pursuing inventions refused by UPI.

ii. Other Examples

Another example of a modified patent management agreement is demonstrated by the University of Kansas and Research Corporation. Under a new arrangement, a representative of Research Corp. travels to the university campus to seek out inventions among researchers. In addition, the University established an ad hoc committee to review inventions, rather than relying solely on the determination of the Research Corp. representative concerning the commercial potential of research results.

Purdue University has a similar arrangement with Research Corp.

in which a representative from the firm contacts each faculty member who has a research grant to determine whether any research results should be disclosed for possible commercialization.

3. Revisions to Royalty Arrangements

Another practice used to promote technology transfer within the university is the revision of the university royalty distribution arrangement with faculty inventors. For example, the University of Michigan changed its royalty distribution as an incentive to inventors following the recommendations of two faculty committees. The old distribution formula provided for a flat 20 percent share of the royalty income to the inventor. The remaining 80 percent was divided evenly between the inventor's department or school and the university to support further research. The newly revised formula provides for distribution of royalties, after the university recovers its expenses for patenting and licensing the invention, in accordance with a sliding scale providing for 50 percent of the first $100,000 of royalty income to be distributed to the inventor and the remainder divided evenly between the inventor's department and the university, 40 percent of the second $100,000 to the inventor and the remainder divided evenly between the inventor's department and the university, and 20 percent of any amounts over $200,000 to the inventor and the remainder divided evenly between the inventor's department and the university. The university's share is used to maintain and expand the Intellectual Properties Office. The department or school may use its share to support research activities of its faculty, at the discretion of the unit

head.

The University of Washington also has a revised royalty distribution plan. After recovering an amount equal to 15 percent of the royalties for administrative expenses of the Washington Research Foundation, royalty income is distributed as follows: the inventor receives 100 percent of the first $10,000. Any amount received above $10,000, but not exceeding $40,000, is divided among the inventor (50 percent), the inventor's department (25 percent), and the Graduate School Research Fund (25 percent). Any amount over $40,000 is divided among the inventor (30 percent), the inventor's department (20 percent), and the Graduate School Research Fund (50 percent).

Modified royalty distribution arrangements were reported widely by respondents as an incentive to researchers to disclose inventions and to remain in the university rather than to enter the private sector in order to commercialize research results.

C. Summary

The survey responses regarding the efforts of universities to enhance technology transfer of university inventions conducted within the university's organizational structure tend to show that:

* most institutions have increased the number of personnel

responsible for evaluating intellectual property, including the establishment of separate offices to promote technology transfer and to undertake patent and licensing activities;

* many institutions have reduced or abandoned the use of patent management firms because of the lack of their direct accountability to the university;

* most institutions have revised their patent policies to direct university resources to develop inventions and redistribute royalties to create incentives for faculty.

Part IV - Technology Transfer Conducted From Outside the University

A. Background

The survey questionnnaire asked respondents to describe any new entity created by the institution outside the university's organizational structure to undertake development and technology transfer of inventions. The survey asked respondents to describe how the decision was made to establish such an entity and the nature of the relationship between the entity and the institution.

Universities have undertaken technology transfer for many reasons, including:

* to promote economic development in the state;
* to attract and retain faculty;
* to generate income for the university;
* to fulfill a social duty to translate ideas to useful products and services.

Why a university establishes a technology transfer entity outside its organizational structure is a complicated question. Some institutions hope that the functions to be performed will be more efficiently carried out if their own decision-making structure is not utilized. Others believe that the types of decisions to be made, (i.e. the evaluation of the commercial potential of an invention and the successful development and marketing of a product) should not be under consideration by the very administrators that are operating an institution to perform

basic research and to educate students. Income from commercial activities may jeopardize the tax-exempt status of the institution.

The anticipated advantages of conducting an institution's patent, licensing, and other technology transfer activities outside of the university include:

- providing greater identity and visibility of those activities to the business and venture capital community;
- avoiding entanglement with university requirements or administration or, in the case of public institutions, statewide or systemwide restraints;
- allowing for flexibility within the new organization to respond to opportunities without taking the entire university's interests into consideration.

B. Results of Survey

Based on the responses to the survey, entities to conduct technology transfer outside the university may be placed in two categories: nonprofit foundations and for-profit corporations.

Few universities reported on technology transfer activities outside their university. The institutions that did report that they had established foundations or corporations outside the university provided descriptions or materials that promoted their activities and future plans. The actual accomplishments of these activities, however, generally remain untested.

One recently established foundation has been denied tax-exempt status by the Internal Revenue Service. The Service's decision was upheld by the United States Tax Court, which agreed that the commercial activities of the foundation interfered with its charitable, scientific, or educational purpose.

In the case of the for-profit technology transfer companies established by universities, the Clearinghouse was unable to acquire information on the financial status of the companies. Although this lack of information alone does not lead to a generalization. several university administrators contacted by AAU expressed disappointment and uncertainty regarding the ability of these companies to attract investors.

1. Nonprofit Foundations

a. General

Of the 39 respondents, ten reported that their universities had established nonprofit technology transfer foundations. Nonprofit technology transfer foundations of universities have been established for the primary purpose of owning the university's patented inventions and supporting further research on campus with the royalty income received from commercialization of those inventions.

b. Example: Wisconsin Alumni Research Foundation

The classic example of a nonprofit technology transfer foundation

is the Wisconsin Alumni Research Foundation (WARF) at the University of Wisconsin. WARF was founded in 1925 when the University Board of Regents refused to permit the university to apply for a patent on a university scientist's discovery that vitamin D could be produced in foods and drugs through ultraviolet irradiation. WARF accepted the scientist's assignment of the discovery and proceeded to patent and license it, directing much of the income from the discovery to the university.

WARF continues to patent faculty inventions and to support further university research with the proceeds. WARF's articles of incorporation (second restatement, May 2, 1975) state its purposes, including:

> To promote, encourage, and aid scientific investigation and research at the University of Wisconsin by the faculty, staff, alumni, and students thereof, and to provide or assist in providing means and machinery by which their scientific discoveries, inventions, and processes may be developed, applied, and patented, and by which such utilization or disposition may be made of such discoveries, inventions, and processes and patent rights or interests therein as may tend to provide funds for and to stimulate and promote further investigation and research within said University.
>
> To pay out and distribute the corporation's funds to or for scientific investigation and research at the University of Wisconsin. /8

WARF is totally independent of the university. It has no faculty members, regents, or administrators on its Board of Directors. WARF acts as the patent and licensing manager of an invention assigned to it.

Until 1983, WARF provided fifteen percent of the net royalties on

an invention to the inventor. At that time, WARF's royalty payment policy was changed. Presently, an inventor receives a $1000 payment from WARF when a patent application is filed on his or her invention. If the invention is successfully licensed, the inventor is entitled to twenty percent of the gross royalty payments received by WARF on the invention. WARF will accept an equity interest in an inventor's company when the company is the licensee of the invention.

In addition, fifteen percent of the gross income is provided to the inventor's department to support research. The departmental executive committee decides how this research support will be used, and may decide to invest the funds to produce income for the department to use for research. The remaining income from the invention is provided to WARF to carry out its support of research at the university.

WARF's support of research activities at the university is extensive. WARF provides all of its net income each year to the university to support research activities ($8.5 million in FY 1986). The overwhelming majority of WARF's current income is derived from an endowment which has been the beneficiary of royalty income from a small number of highly successful patents, including the irradiation process dating back to WARF's inception. WARF attributes its continued success in part to the outstanding financial management of its portfolio.

WARF does not participate in the selection of research to be funded. The Graduate School Research Committee, which consists of over 30 rotating faculty members appointed by the Chancellor of the Madison campus. submits a budget request to WARF each year based upon research proposals approved by the Committee for funding. Proposals are submitted directly to the Committee by faculty members.

Recently, WARF expanded its role beyond patent management. It organized a wholly-owned fully taxable subsidiary in 1984 to design, manufacture, and market an improved hearing aid device based on digital microchip technology. The new company is a joint venture with an established Wisconsin corporation and is intended to reduce the lead-time between research and delivery of the product to the marketplace.

c. Example: Brown University Research Foundation

The Brown University Research Foundation was chartered to develop technology transfer with industry. The Foundation is a separate legal corporation from the University, but its Board of Directors consists entirely of university administrators. The University pays the Foundation for its services and all royalties are provided to the University for distribution in accordance with its patent policy. Beyond the typical patent and licensing arrangements, the Foundation has formed new ventures, including an arrangement in which the university and a corporation became

to conduct such activities outside the university is for-profit corporations. Of the 39 respondents, five universities reported that they had established technology transfer companies.

b. Example: Michigan Research Corporation

The University of Michigan established the Michigan Research Corporation (MRC) in 1985 to develop inventions of University faculty and to promote technology transfer and entrepreneurship at the University. The original idea for a technology transfer entity was suggested by a fifteen-member Task Force on University-Industry Interaction, composed of faculty members and administrators appointed by the University's Vice-President for Research in 1981. The Task Force recommended that a nonprofit entity be established to act as a broker between faculty and industry to commercialize their research ideas. The Task Force report suggested that MRC be controlled by a Board of Directors to include business representatives but with majority University representation on the Board. MRC would also be guided by a Scientific and Technical Advisory Board to identify activities with commercial potential and to review proposals for new programs. MRC would contract with the University for office space and administrative and business services. In all other respects, MRC was conceived by the Task Force to have the same access to University facilities as any other University unit.

The Task Force anticipated that MRC would aggressively pursue the commercial exploitation of research results. MRC would create

interdisciplinary project centers to develop research results and compensate its staff competitively with the private sector. Actual development of a marketable product would be conducted by licensees or by the faculty inventor through his or her own company, which could receive financial. management, and business liaison assistance from MRC. "In either case, MRC, the faculty entrepreneur. and the University could have equity positions in the product being marketed." /9 The Task Force expected MRC's capital to come from several sources. including the University, industry, private foundations, and the federal government.

Further consideration of the concept was undertaken by a faculty member and an administrator, with the assistance of a faculty steering committee. They produced options to be considered by the Faculty Senate on June 21, 1982 which dispensed with the nonprofit model and recommended a for-profit MRC. Their written recommendation is attached as Appendix C.

Following the adoption of the recommendation to establish a for-profit company, the University Regents approved a loan to MRC.

The University and MRC entered into a contractual arrangement on March 20, 1985 entitled "The University of Michigan Commercial Development Sponsorship with the Michigan Research Corporation". That document identified the area in which the University expected MRC to be most active: "the commercial sponsoring of an undeveloped idea which has the potential for commercial success,

but needs significant further sponsored research and development, and business sponsorship to develop its potential." /10 MRC is expected to be advised by the University's Intellectual Property Office of new ideas resulting from research at the University. MRC will then be given an opportunity to complete a patent search and develop a business plan, during which time the University will refrain from pursuing any arrangements with other third parties for commercialization. If accepted by the University, MRC's plan will be implemented during a "time-limited exclusive option to arrange for commercialization". /11

Further amendments to the document were agreed to on April 23, 1986. /12 It provides procedures for MRC's development of start-up companies with faculty and allocation of an equity interest in such companies to the university.

MRC is still in the early stages of its activities. It has been seeking Small Business Innovation Research (SBIR) funds from the federal government to provide funding support for its operations. No information is available regarding MRC's ability to attract funding or its technology transfer activities.

c. Example: University Research Corporation (Colorado)

The University of Colorado established a for-profit corporation named University Research Corporation (URC) in 1983. The corporation's Articles of Incorporation state that its purpose is: "to develop and market research discoveries, to invest in and operate business entities established to develop and market

research discoveries, all generally in cooperation with research institutions located within the State of Colorado." /13

URC is authorized to issue common stock and to offer its stockholders the right to invest in spin-off ventures resulting from its technology transfer activities, to provide funding in exchange for equity interests in spin-off companies, and to enter into joint ventures to support an inventor's commercialization of new technology. URC's Board of Directors is intended to be independent of the University, although it is to include one representative of the University of Colorado Foundation. URC is also in the early stages and no information is yet available regarding its financing or technology transfer activities.

d. Joint Ventures

Two universities reported that they have joined with venture capital firms to establish for-profit corporations. Washington University is in the formative stages of establishing an organization using university technology to start new local companies. The university will provide the technology, the venture capital company will manage the company, screen the technology for commercial viability, organize and staff the new companies, provide or attract needed capital, seek licensees, arrange for product development, and sell or convert start-up companies to publicly-held corporations.

The Michigan State University Foundation supported the creation

of the Neogen Corp. in 1981. Neogen also received funding from venture capital companies. Its purpose is to develop products and services from Michigan State University research, to arrange for faculty to undertake ownership in technology they develop, and to enhance biotechnology development in the State of Michigan. Neogen supports research at Michigan State and receives a license to any patentable inventions resulting therefrom. Neogen can develop a new product from an invention or support a new start-up company. The faculty may submit research proposals to the University to be presented to Neogen for funding. However, the company conducts its own evaluation of the research proposals it selects for support.

e. Wholly-Owned Subsidiaries

Two universities have established wholly-owned subsidiaries of the university to conduct technology transfer activities. Washington University established the Washington University Technology Associates (WUTA) to undertake product development activities from technology developed at the Engineering School. WUTA was established to perform or contract out product development, to start-up small companies, and to assist small companies with licensed technology.

Case Western Reserve University established a wholly-owned subsidiary which was named University Technology Incorporated (UTI). UTI has responsibility for commercial technology transfer campus-wide. It has an independent Board of Directors selected by

the University. UTI was created to evaluate the commercial potential of university technology, to design and implement development strategies, and to market technology. UTI may license an invention, enter into joint ventures, and assist in creating start-up companies. The University's Office of Research Administration reviews invention disclosures and then refers them to UTI. If the technology requires further research, the Office of Research Administration is prepared to assist the researcher in obtaining further research support. If the invention requires further development, UTI will arrange development support. The company also provides an intellectual property protection strategy, assesses the market for the product, designs a business strategy for marketing the product, and arranges for financial underwriting of the product.

C. Summary

Whether universities will successfully establish technology transfer entities outside the university structure remains unanswered. The nonprofit model has been challenged by the Internal Revenue Service because of its commercial activities. However, the for-profit entities do not yet have any discernible track record for attracting investors. It remains to be seen whether universities will be able to structure technology transfer and commercial development activities in a manner that maintains the university's academic and research missions and undertakes successful commercial activities.

PART V - CONCLUSIONS

Can universities support research activities in an impartial scholarly manner and then participate in the commercialization of research results as competitors in a business environment? It is clear that universities are exploring this question and will experiment with different structures to combine these two goals. The success of such activities depends upon the expectations of the institutions. The universities that have chosen to reorganize their internal patent and licensing capabilities have already achieved increased disclosures and income from licenses. The universities that are currently trying to organize technology transfer entities outside the university structure may have difficulty finding a nonprofit structure that can be sufficiently entrepreneurial or a corporate structure that can compete with private business. Federal and State incentives have increased the odds for success, but whether universities will find it worth the effort and expense of being their own entrepreneurs is yet to be determined.

NOTES

1/ See Report by the Comptroller General of the United States entitled Federal Agencies' Policies and Practices Are In Accordance with Patent and Trademark Amendments of 1980.

2/ Ibid.

3/ Committee Report of the House Science and Technology Committee accompanying H.R. 5003, The Uniform Science and Technology Research and Development Utilization Act, ordered to be printed August 15, 1984, p.14.

4/ Technology and Growth: State Initiatives in Technological Innovation, final report of the Task Force on Technological Innovation of the National Governors' Association, October 1983, p. 8-9.

5/ Letter dated September 4, 1985 to AAU from Katherine C. Lyall, Acting President of the University of Wisconsin, p. 1.

6/ See May 1, 1985 letter from James R. Brophy, Vice President for Research at University of Utah quoting remarks of President Peterson at meeting of the University's Institutional Council.

7/ Servicing Agreement between the Regents of the University of Colorado and University Patents, Inc. dated May 19, 1981, revised October 10, 1984, p. 4.

8/ Second Restated Articles of Incorporation of the Wisconsin Alumni Research Foundation, as of May 2, 1975, Article 3. Paragraphs (1) and (2) of Item B.

9/ "Interim Report of the Task Force on University/Industry Interaction." University of Michigan, June 2, 1981, p. 5.

10/ "The University of Michigan Commercial Development Sponsorship with the Michigan Research Corporation." March 20, 1985, p. 1.

11/ Ibid, p. 3.

12/ Letter to Reed B. Harker, President, Michigan Research Corporation from Linda S. Wilson, April 22, 1986.

13/ Articles of Incorporation of the University Research Corporation, April 15, 1985, p. 1.

Association of American Universities

Office of Federal Relations

April 26, 1985

TO: AAU PRESIDENTS AND CHANCELLORS

FR: ROBERT M. ROSENZWEIG

RE: CLEARINGHOUSE ON UNIVERSITY-INDUSTRY RELATIONS

I am writing to ask your cooperation on the second project of the AAU Clearinghouse on University-Industry Relations. As you will recall, the Clearinghouse was established in response to congressional concern that universities must be aware of the potential "ethical dilemmas" posed by research activities with industry. The Clearinghouse has been in operation since 1983, collecting and disseminating information. The first report of the Clearinghouse was issued in February of this year and it concerns conflict of interest and delay of publication. The information we received as a result of the first request is informative both in demonstrating how each institution resolves its own policy problems and in establishing how research universities are addressing these issues generally.

We are now requesting information on activities intended to extend the university's role in the research enterprise beyond the conduct of basic research to include participation in the transfer of technology to the marketplace. The range of possible activities reaches from an active patent and licensing program to the establishment of a corporation to develop products resulting from university research. We would like to receive descriptions and accompanying documentation, including any public relations materials. Equally valuable are examples of such activities which the university decided not to undertake, or which the university abandoned.

I recognize that we are not asking easy questions, but the thoroughness of each response is crucial to the success of our effort. As before, we are not requesting confidential information. If it is necessary to delete names, dates, dollar amounts, or other specific details from documents, we would be pleased to receive them in such form. The actual language of contracts and policies is especially useful.

The following examples may make clearer the kind of information we seek and the value that such information might have to university officers.

In response to changes in the law which permit universities to own the patent rights to inventions developed with federal funds, University X has decided to develop its in-house patent and licensing capacity. In addition, the university is undertaking a new marketing strategy to inform possible licensees of the inventions available for licensing by the university and is encouraging faculty members to be aware of the commercial applications of any inventions developed in their laboratories.

1. Has your institution adopted new procedures to enhance the income flow to the university from the development of research results?

2. If so, describe the procedures adopted, i.e. have you created a new office or hired new staff, have you developed a public relations campaign?

3. If not, do you use a patent management firm to evaluate inventions and seek licensing arrangements?

4. Are you conducting an active search among faculty for technology innovations and inventions that could be licensed?

5. Have the changes in federal patent policy within the last five years influenced how your university treats non-federal support of research? Have these changes influenced how your university treats technology transfer and marketing of research results?

Some institutions have taken steps beyond the above example to create a new entity outside the institution's research structure to undertake development and technology transfer of inventions.

Several institutions are involved in the activities of a non-profit research center, funded by corporate investment, which enters into funding agreements with the universities and receives licenses to any patents. The research center then transfers the licenses to a separate corporation established by the same corporate supporters to develop the patented technology. The research center owns one third of the corporation stock.

Another institution has established a for-profit corporation to develop products and support new start-up companies from technologies available at the university. Outside investors may make investments in the corporation. All decisions regarding the identification, screening, and evaluation of technologies is conducted by a committee of university faculty members.

1. Has your institution embarked on similar ventures? Please describe them.

2. If so, how did the university make the decision to undertake them; i.e. was the institution approached by outside interests, was the decision presented to the faculty, did the institution receive legal (including tax), advice?

3. Are there policies or limits, either written or understood, that govern the relationship between the new ventures and the university? For example, does the university or its faculty participate in the selection of research to be supported by the new entity?

4. Has the university accepted any new financing arrangements for research or development as a result of this new enterprise?

We are interested in receiving any other information about similar arrangements at your institution or actions your university has taken to enhance the transfer of technology developed on your campus.

The final aspect of the university's role in technology transfer in which we are seeking information relates to the university's intellectual property policies. We are interested in receiving written policies regarding patents, copyrights, trade secrets, software, licensing, and royalty distribution. Examples of negotiations with industrial sponsors and licensees would be very useful.

1. If your institution has established a mechanism to enhance technology transfer, how has the university addressed the treatment of technology that is not patentable?

2. If your university has established a separate entity to undertake technology transfer, does that entity have separate policies regarding the treatment of intellectual property?

3. When the university itself is evaluating the commercial applications of an invention, it may determine that the technology is not patentable but could be valuable as a trade secret. How has your university addressed the protection of trade secrets?

I know we are asking your institution to undertake a significant task in responding to this request. I am convinced that it will be in the university community's best interest to share information. It is important to demonstrate to those who are concerned about the ethical and legal problems often associated with research business ventures that universities are addressing them. We hope your institution can assist in this effort.

All responses should be received at AAU by June 15, 1985. Please direct any inquiries and responses to:

April Burke
Director
Clearinghouse on University-Industry Relations
Association of American Universities
One Dupont Circle, N.W., Suite 730
Washington, D.C. 20036
202-466-5030

Please let us know the name, address, and phone number of any member of the university's staff who will be assisting with the response to this request.

Thank you.

LIST OF RESPONDENTS

Brown University

Carnegie-Mellon University

California Institute of Technology

Case Western Reserve University

Columbia University

Cornell University

Duke University

Harvard University

Iowa State University

Johns Hopkins University

Michigan State University

New York University

Northwestern University

Ohio State University

Pennsylvania State University

Princeton University

Purdue University

Rensselaer Polytechnic Institute

Rockefeller University

Stanford University

Tulane University

University of California, Berkeley

University of California, Los Angeles

University of California, San Diego

University of Colorado

University of Illinois

University of Iowa

University of Kansas

University of Maryland

University of Michigan

University of Missouri

University of North Carolina

University of Pennsylvania

University of Pittsburgh

University of Texas

University of Utah

University of Virginia

University of Washington

University of Wisconsin

Vanderbilt University

Washington University

Yale University

APPENDIX C

Senate Assembly Meeting
of June 21, 1982

Recommendation Options for The University of Michigan Toward the Establishment of a "Michigan Research Corporation"

by

Dr. Walton Hancock and Larry Crockett
Institute of Science and Technology

In response to strong faculty expressions of interest in transferring their scientific technology to the industrial/business sector, the Vice-President for Research appointed a 15-member joint faculty/administrators' task force. Chaired by Dr. Robert Howe, this group developed in June 1981, the "Interim Report of the Task Force on University/Industry Interaction" which recommended the creation of a non-profit Michigan Research Corporation (MRC) to act as a "broker" to industry for interested faculty, to support technology transfer for commercialization of their research ideas. It was believed that such an organization would foster intellectual scientific interaction between the University and local industry, to the benefit of both, and would help to retain in Ann Arbor our more entrepreneurial faculty, graduates, and spin-off high technology companies. Other universities had experienced or were anticipating losses of major faculty members to private industry, and a number of universities had or were establishing centers, foundations, or corporations to assist their faculty and hopefully to generate income for the universities.

After campus-wide discussion of the Howe Report with deans and faculty committees, the Executive Officers accepted the recommendation that more specifics on an MRC needed to be developed and comparisons be made to similar organizations already existent or being created at other universities. A growing number of such institutions were also making multi-million dollar research and development arrangements with private corporations, designed to help faculty research and training efforts, while providing ideas through licensing to industry.

Thus, under the auspices of the Institute for Science and Technology, we (Dr. Walton Hancock, Professor of Industrial and Operations Engineering and of Hospital Administration, and Larry Crockett, Research Program Manager of the Special Projects Division of IST) were assigned to do a thorough study and develop further the concept of an MRC. We reviewed our ideas with a faculty Steering Committee consisting of Drs. David Brophy, James Duderstadt, Thomas Dunn, George Gamota, Robert Howe, Raymond Kahn, and Joseph Martin. We then:

(1) expanded the Howe Report's list of universities that have formal technology transfer operations, and either talked to the parties involved or visited them;

(2) talked to people in the University concerning the desirability of the establishment of an MRC;

(3) developed a bibliography with 114 citations on these subjects; and

(4) wrote a report which contains a discussion of what were perceived to be the more critical issues, with appendices documenting the efforts of 28 other universities in technology transfer.

That Report, published January 7, 1982, by Hancock and Crockett, "Discussion of the Michigan Research Corporation Proposal"*, has been discussed with a number of University committees, including deans, directors, research administrators, executive committees, and faculty groups. While favoring the creation of some sort of MRC organization, the report purposefully did not make recommendations about where the MRC should be located (inside or outside the University), how it should be controlled or constituted (non-profit or for-profit), how it should be financed (University and/or private funding), etc.

However, in response to such questions from faculty and administrators at all the presentations made to date, we have outlined three recommendation options for The University of Michigan toward establishing an MRC-like organization:

#1. Set up a for-profit corporation outside the University--
We strongly favor this recommendation.

#2. Set up a non-profit MRC-like group within the University--
We feel this is possible but considerably weaker than #1.

#3: Do nothing about an MRC--
We feel this will not help our faculty and will continue our weak image and low profits in technology transfer.

RECOMMENDATION #1: Set Up a For-Profit Corporation Outside the University

The University would become a minority stockholder in a new Corporation. The University would provide a one-time equity of approximately $200,000. These start-up monies would be used to:

a) Identify one or two University faculty ideas with excellent commercial potential.
b) Organize the Corporation.

*A copy of the full report is available from IST Special Projects Division.

c) Appoint a president.
d) Attempt to obtain research and operating funds to reduce the ideas to a marketable product. This will include equity capital from venture capital companies, individual investors or private industries.
e) Obtain support from the State of Michigan and/or foundations if possible.

The first priorities of the Corporation would be to:

a) Perform market evaluations and attempt to identify two or three potential commercial ideas by extensive contacts with faculty and staff.
b) Raise operating funds through grants and equity capital. Estimated needs are $500,000 - $1,000,000 per project to be commercialized. Limited research partnerships would be used as desired to attract private investments; this year's Federal Income Tax credits make such investments very attractive. Grants from government agencies, foundations, and business organizations would be sought. Equity capital might later be raised from the sale of stock on the open market.
c) Contract with the University faculty to do as much as possible of the research and development work. This will provide substantial funds to the University for its faculty and staff to perform their desired research.

At the same time, we strongly recommend that the University itself continue to operate the patent/licensing functions it does in the Division of Research Development and Administration, but with:

a) an expanded staff that could more actively encourage patentable ideas
b) a revision of the patent policy to provide more monetary incentive to the author/inventor in royalty return
c) a computer software licensing policy different from the patent policy, with sufficient flexibility to provide for ongoing support of software systems.

<u>The Advantages of Recommendation #1 (Separate Corporation) are:</u>

a) Ability to obtain equity capital outside the University.
b) Responsible involvement/investment by individuals or businesses.
c) Research to be funded whenever possible at the University.
d) Maximum flexibility to respond quickly to changing conditions (to form new corporations, start limited research partnerships, pay staff competitive wages, etc.).
e) Business-oriented, technically-expert staff will provide strong decision-making.
f) Small investment by University
g) Limited University liability on commercial products.
h) Higher probability of getting State Development funds that would not detract from general support to the University.
i) Enhanced total University environment

j) Improved economic environment of the State and Ann Arbor. (Within our State last year, the Michigan State University Foundation legally incorporated in this way the new Neogen Corporation).

The disadvantages of Recommendation #1 are:

a) The University would not completely "control" the Corporation, but would have a say as a stockholder.
b) The risk of failure of the effort is higher because of the limited support from the University.
c) Some faculty may find the new industrial environment more favorable than that of the University, although other faculty may stay at the University because of these new local entrepreneurial options.
d) Surplus funds accruing to the University may depend upon its equity commitement, although the University's main equity will likely be the faculty ideas and research products, for which a share of the commercial profits will be claimed.

RECOMMENDATION #2: Set up an MRC-Like Group Within University, (Probably in IST)

The University would:

a) Establish an internal technology transfer organization within the University, probably in the Institue of Science and Technology.
b) Fund the group for at least two years at an estimated cost of $120,000 per year.
c) Solicit from the faculty and staff potential commercial ideas, and get a technical and business market analysis to help select promising ones for development.
d) Revise staff salary policies so that our competitive position could be maintained relative to industry.
e) Give the organization sufficient power to:
   (1) Execute licensing and royalty arrangements.
   (2) Execute contracts.
   (3) Establish compensation levels.
   (4) Establish limited research partnerships with external sources.
f) Revise the University patent and software policies and expand the patent staff (not part of the above $120,000) as indicated in #1 above.

The first priorities of the organization would be to:

a) Establish a nonprofit corporation called the Michigan Research Corporation (MRC).
b) Solicit potential commercial ideas from the faculty and staff for development.
c) Raise funds through grants, selected licensing arrangements, and limited partnerships.

d) Transfer funds to get research accomplished as much as possible by the faculty and staff within the University organizations.
e) Arrange for the work to be accomplished elsewhere if it is not appropriate for the University.

The Advantages to Recommendation #2 (MRC within University) are:

a) The University would have complete control.
b) The activity is part of the present charter of IST.
c) The total University environment would be enhanced.
d) All surplus funds generated would accrue to the University.
e) An improved economic environment of the State might result.

The Disadvantages of Recommendation #2 are:

a) If the MRC group is not successful, the University would have a continuing liability for personnel, etc.
b) The University may have direct product liability on those items commercialized.
c) There is a lack of speed, flexibility, and tough business decision-making authority in University units.
d) There is no precedent for this high level of delegated authority within the University.
e) The business community will have difficulty becoming involved at a responsible/investment level. (In this State, Michigan Technological University has recently established Michigan Tech Ventures, Inc., a wholly-owned internally-funded, for-profit corporation to overcome this difficulty.)
f) It will not be able to obtain equity capital from the outside.

RECOMMENDATION #3: Do Nothing About an MRC-Like Organization

The University would:

a) Be encouraged to modify the patent and software policies and support as indicated in #1 above, but
b) Continue to support patents and licensing at a relatively low level.