Turning the Corner

A Report Providing Review and Guidance to Technology Transfer at the University of Missouri

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American Association for the Advancement of Science
Research Competitiveness Service

October, 2003
Introduction

This is a report from a panel organized by the Research Competitiveness Service of the American Association for the Advancement of Science (AAAS). The panel’s purpose was to provide external advice and guidance on technology transfer at the University of Missouri. At the request of the Vice Provost for Research (VPR) at the University of Missouri-Columbia (MU), AAAS assembled a panel to review background materials, conduct a site visit, and address a set of focus questions. The focus questions were developed by the VPR, the Director of the Office of Technology and Special Projects (OTSP), and AAAS, and are listed in Appendix A below.

The panel of Mark Crowell, Associate Vice Chancellor for Economic Development and Director, Office of Technology Development, The University of North Carolina at Chapel Hill; Joe Fink, Vice President for Corporate Relations and Economic Outreach, University of Kentucky; and Mike Martin, Executive Vice President, Virginia Tech Intellectual Properties, accompanied by Ed Derrick, AAAS, conducted its site visit on September 30 – October 2, 2003. The agenda for the site visit is included as Appendix B. At the end of the site visit, an exit briefing was held with the VPR of MU; the Vice President for Academic Affairs for the UM System; and the Director of the OTSP to discuss the panel’s initial findings. A summary report following that discussion and summarizing the panel’s findings has been submitted. This full report expands on the findings and recommendations contained in the summary, and provides model forms from other university offices.

The structure of the report is as follows: after this introduction, sections will discuss the mission of technology transfer; the strategies to realize the mission, and their relevant measures of success; and the structure and budget for the operations to realize these strategies. Appendices include the focus questions posed to the panel, along with brief answers; the agenda for the site visit; and sample technology and invention evaluation forms from Georgia Tech and Virginia Tech.

The report title, “Turning the Corner,” reflects the observation made repeatedly to the panel that technology transfer operations at the university have improved considerably over the past few years, but still have a distance to go before stakeholders are satisfied. With the establishment of OTSP in 1999, a major step was taken, and there has been substantial progress since then. Now, with the declaration of economic development as the fourth mission of the university, is an opportune time to take another major step. A common perception of university policy and action in this area has been that the university is overly risk averse, and that the approach has been from a regulatory rather than a transactional perspective. Turning to an orientation of enabling rather than regulating will have a significant impact.
**Mission**

The questions posed to the panel outlined three functions for OTSP which we will call strategies for achieving its mission: (1), managing the intellectual property (IP) of the university; (2), building the infrastructure for entrepreneurial activities; and (3), acting as key liaison from the university to the economic development community. The panel found that office resources were also being spent on a fourth function in evaluating and responding to IP-related provisions in sponsored projects contracts, material transfer agreements (MTAs), and confidential disclosure agreements (CDAs).

Faculty clearly perceive the most important strategy to be managing IP; those outside the university agree, though add that the IP management should emphasize economic development for the city, region and state.

Since inception, the office has increased investment in patent applications and added new professional licensing personnel with market and technical domain expertise. Now is the time to communicate this investment and maximize its potential in order to achieve success. The allocations of resources of the office, including time of professional staff and budget, did not connect with the perceived importance of each strategy. Considerable leadership and staff time is spent on economic development initiatives. Licensing staff time is increasingly taken up with MTAs and CDAs. The “mission creep” has created stress and strain, as well as the perception of a bottleneck in deal flow, all of which contributes to a continued legacy of perceived lack of responsiveness and effectiveness on behalf of the faculty.

**Recommendations:**

The mission of OTSP needs to be clearly, concisely and consistently communicated inside and outside the institution. For the purpose of this review, we take the mission to be closely tied to the mission of the Office of Research, and assume the mission to be: “To support research and technology development for the University of Missouri System to promote an environment in which the intellectual and creative activities and achievements of faculty, staff and students are facilitated, celebrated, and when appropriate, transferred to the private sector.”

The panel believes that OTSP can take on the bold but realizable vision to serve as the focal point and catalyst for change to establish economic development as the fourth mission of the university.

This vision and mission will be realized through all three strategies; the fourth (reviewing intellectual property provisions in MTAs, CDAs, etc) should be handled by the Office of Sponsored Programs on each campus. The strategies are not independent: OTSP cannot be a leader in the economic development mission of the university until it solves the problem of management of IP for commercialization and acquires the support of faculty.
Following preparation of a clear and concise mission statement, it should be given wide publicity, and appropriate campus officials should make themselves available for interviews with representatives of the media around the state to discuss this next step in implementation of the "fourth mission." The President has laid out the vision for the mission; this is follow-up implementation with more details about how faculty, staff, students and other citizens can interact with the institution to make it come alive.

The following section outlines three coordinated, comprehensive strategies which are recommended for OTSP. Each of the three strategies that follow requires the coordination of a number of related activities, both inside and out of the university. Multiple players are involved in the transfer of technology from the university. It is essential for OTSP, the VPR at Columbia (and the other campuses as well), and others to realize that the strategies need to be adopted by OTSP; resources need to be aligned accordingly within OTSP and throughout the university; OTSP management and employees need to create work plans, and need to be evaluated, focusing on implementing these strategies; and OTSP, its management, and the university leadership need to communicate their endorsement of these strategies to the university community and to the many constituencies involved in the local, and regional and statewide technology-based economic development enterprise in order to obtain buy-in, support, and related strategic advantages.
**Strategies**

**Strategy 1: Managing university IP**

There are multiple purposes and consequences of the management of university IP: service to faculty, economic return for the university, and economic development for the region. Different universities adopt policies that emphasize different purposes; the appropriate measures of success then follow from the chosen purpose. The panel finds that there is a disconnect in the approach taken at OTSP: the budget is allocated as if the primary focus is service, with increased budget available for patenting and added personnel with domain expertise. However, success appears to be measured like a focused investment business model, focusing on the few disclosures that will bring in the best return to the university as measured financially (looking for “home runs”), and on commercial marketplace outcomes that are not closely related to the service mission.

Another key aspect of enhancing the management of university intellectual property is related to the policy and personnel infrastructure in place and the need to ensure it is well developed and positioned to provide excellent, timely, and valuable service to OTSP’s faculty and corporate customers. During our interviews with faculty, a recurring theme was that service to faculty was not emphasized. It appeared that an inordinate amount of time is taken to evaluate disclosures, communicate to faculty the plan for commercialization, implement the marketing of disclosures, close deals, and distribute royalty inventor’s share of licensing income.

Yet, the staff are clearly liked and respected, despite the perceptions regarding service. This respect provides a strong base on which to build new approaches, strategies, and solutions. A clear priority statement should be crafted to guide the efforts of the staff. If service to inventors and getting the IP out into the community and used is the overarching goal rather than revenue generation, this should be communicated first to the staff and then the entire university community.

Part of the issue with timing of closing deals is the perceived role of the Office of the General Counsel. Both faculty and OTSP personnel believe that there is limited access to the university attorneys to approve deals. Steps should be taken to clarify that the role of the legal staff is to provide advice; the role is not to decide.

Moreover, if the institution is willing to give the office a mandate to become more entrepreneurial, and vest the director with authority to assume more risk in order to get technology out and used, then that should be clearly communicated to the staff. That approach should also be clearly communicated to the legal staff by those at the highest possible levels.

A further factor contributing to the faculty perspective is the impression that the process of technology transfer is a black box, which is not available to the faculty.
Recommendations:
The panel recommends a focus on service to faculty rather than economic return to the university. OTSP should create an IP management system that encourages disclosure, provides feedback and status of evaluation, manages the patenting process, identifies an appropriate commercialization pathway, negotiates deals that emphasize dissemination of knowledge, and quickly distributes the share of licensing income to inventors, while ensuring that licensees are diligent in commercialization.

Appropriate goals under this strategy for OTSP are:

- Increase disclosure rate, number of deals, patent applications, patents issued, business start-ups, technology strength (patent index), and licensing income to exceed or equal 5 peer institutions.
- Improve inventor satisfaction as measured by pre and post customer survey.
- Improve turn around in OTSP office on negotiations of licensing deals and research agreements from weeks to days.
- Distribute all outstanding licensing income, and implement a policy/procedure to distribute licensing income within 45 days of receipt of payment by licensee (except for plant varieties). Negotiate payment schedule with College of Agriculture.
- Develop equity distribution policy.
- Harmonize income distribution policy for patents and copyrights.

Note that to be successful in achieving these goals, each of them must have a date by which it should be done (sometime in 2004 for most); a person assigned responsibility for its completion; and necessary time and resources budgeted.

There are a number of tactics that will help the office achieve these goals:

- Provide a description of the process to the faculty (as an example, see http://www.vtip.org/information-for-inventors.htm for “Roadmap for inventors”).
- Reexamine how business is done with faculty, particularly, ensure that communications with inventors happen in a timely fashion. Consider adopting a gating process (see http://otl.gtrc.gatech.edu/OTL_Inventors_Forms.htm for a sample invention disclosure form, and Appendix C for sample questionnaires from VTIP and Georgia Tech). Keep in mind that the initial meeting must not be a challenge to the inventor about patentability but an interview about the value of the invention.
- Eliminate preliminary disclosure form. Return form to inventor for completion or interview inventor to assist in completion.
- Gain agreement from General Counsel on standard templates for licensing agreements, research agreements, MTA, and CDA. Post on web site. Only take exceptions to General Counsel for review and recommendation.
- Establish internal and external advisory boards.
- Insure budget reflects priority of strategies.
- Develop, purchase, and/or deploy a state-of-the-art invention management database.
As to the last point, OTSP should invest major resources in the development or deployment of a modern, sophisticated, electronic invention management database. Such database systems can be expensive in terms of purchase cost or development time and cost; yet, they are essential components of a modern, efficient, financially sound, customer service oriented university technology transfer function.

Further, we advise on ways that the office operations can be structured to support this strategy:

- Reorganize office to provide access to leadership and enable staff to achieve through delegation of negotiating authority and permission to access General Counsel.
- Confirm that all job descriptions and performance measures support the mission and strategies. Evaluate job descriptions and performance regularly for focus.
- Measure and communicate staff performance based on OTSP customer service and IP management goals and strategies such as number of disclosures, number of licenses, response time on disclosures and negotiations, success in timely distribution of royalty payments, etc.
- Assign sufficient staff time to development and implementation of database. The development, management, care and feeding of the database requires a dedicated full time equivalent staff member. A desirable skill for this position is to be a paralegal or similar, to be familiar with the legal issues surrounding patent filings and licensing contracts.
- Establish a web site with access to non-confidential description and status of inventions organized by catalogue; roadmap for inventors; standard agreements; disclosure form; and policies. Update web site regularly.
- Develop a plan for facilities to address present and future needs.

Further discussion of the form and function for the office are in the section “Form, Function and Budget” below.

**Strategy 2: Building, enabling and enhancing the entrepreneurial culture**

The panel found wide recognition of the need to build, enhance, and reward the entrepreneurial culture on campus as a critical step in positioning the university for success in technology transfer and economic development. Many different groups have already embraced this thrust, and undertaken myriad activities designed to foster entrepreneurism and economic development. These efforts need to be coordinated to eliminate duplicate effort and to provide focus.

Faculty, deans, department heads, members of promotion and tenure committees, trustees, and related leaders are key target groups for culture change strategies. Further, the culture change should look externally as well. In this regard, OTSP’s leadership role in the university’s initiatives to implement its new fourth mission – economic development – should be endorsed, announced, celebrated, and reinforced at many
different levels and by many different players and constituents in the university system, state government, entrepreneurial and business communities, investment community, and others.

Recommendation:
A coordinated system-wide effort should be launched to establish the office as THE DOOR to the institution for collaboration and economic development activities. This has both internal and external constituencies. For the faculty, this means that the OTSP can be the primary point of contact for entrepreneurial advice and assistance.

A clear emphasis should be placed on creating and facilitating formation of start-up or spin-out firms with a university connection, balancing the economic development potential with the return on investment potential of the business development opportunity. The focus or “scale-tipping” issue should be the opportunity for creating high-quality jobs for graduates and Missourians.

We suggested that the director convene a University of Missouri Economic Development Council with representatives of the various units currently engaged in such efforts. At the initial meeting, a ranking university official should meet with the group to give them their charge and to clearly vest authority in the director to lead the initiative. There is more than enough work for all to do; there is a lot to be gained if all efforts are coordinated.

**Strategy 3: Acting as key liaison to the statewide economic development community**

The university enjoys great support among the community leaders with whom we met. The thought leaders of the greater Columbia area stand ready to assist the university to move forward in this area. They await leadership and coordination from the institution.

Recommendations:

OTSP should be the primary point of contact (THE DOOR) for institutional economic and technology-based business development activities on behalf of the University of Missouri. OTSP should chair a coordinating committee or council involving related activities and initiatives on campus and in the region – including MIC, the SBDC (and its SBIR/STTR activities), university-related research parks, and prospective incubator facilities.

OTSP should coordinate the development of an economic development “portal” in order to promote research partnerships between University of Missouri faculty and business/industry collaborators. This should include a faculty expertise and capability database (see [http://www.research.vt.edu/vted/index.html](http://www.research.vt.edu/vted/index.html) for an example) and provide access to key data and information. The portal should include “boilerplate” research agreements, materials transfer agreements, confidentiality agreements, invention disclosure forms, listings of technologies available for licensing, and related information.
It should also include a description of the process for faculty (see http://www.vtip.org/services-for-inventors/iproad/default.htm for an example).

OTSP should develop and maintain close working relationships with state and regional venture capital funds and other entities with access to such funds, and should develop regular opportunities for the venture capital and seed funding communities to be introduced to University of Missouri researchers working in areas likely to lead to start-up companies.

OTSP should work with the Vice President for Academic Affairs and with the four Vice Provosts for Research to ensure that appropriate university representatives are named to community, regional, state and national economic development commissions, boards, and related initiatives.

Measures of success for this third strategy are more collaborations with industry, especially within state; availability and investment of venture capital; and quality jobs created.
Form, Function and Budget

Three of the five questions posed to the panel concerned an appropriate structure for technology transfer operations. The panel finds that to match the functions of the office, its form and structure should be changed.

All campuses and the system office contribute to OTSP’s budget; all campuses are served, though the majority of activity is at the Columbia campus, which contributes the most of any campus.

The following figures show the revenue and activity of OTSP broken down by campus. Although these data were readily made available to the panel, we were left with the impression in some of our interviews that there may be misunderstandings around the system concerning these data.

The sources of the office budget are shown in the first figure. As structured, OTSP, though a system-wide effort, reports to the VPR at MU. OTSP receives 39% of its funding from MU, and 61% of its funding from the university system and the other campuses.

![Figure 1: FY 03 budget sources](image)

The disclosures and deals over the past four years are shown in the second and third figures. MU has accounted for 62% of disclosures and 58% of the deals, while Rolla has accounted for 24% of the disclosures and 17% of the deals.
The fourth figure shows licensing income from the past four years. MU’s share of licensing income has been approximately $4.5 million since FY 99 (67% of the net after the inventor’s share).
Recommendations:

Technology transfer performance in all strategies can be improved by adoption of a different organization. The first recommendation of the panel in this regard is the development of a research and economic development foundation for the University of Missouri. Business and economic development activities currently carried out with OTSP should be spun out into an affiliated foundation to facilitate effective, efficient, and sustainable business development activities.

The launch of the foundation should be publicized broadly and announced as a major initiative toward the creation of an entrepreneurial culture and business friendly environment at the university – focusing on its activities as the primary component of the university’s strategy to accomplish its new fourth goal of promoting economic development for the state of Missouri and beyond. The foundation should be structured to pursue technology transfer and economic development activities with speed, agility and flexibility within a framework of well developed and thoughtful policies – while shielding the university from some of the liability and related issues that have led to the risk averse nature of the current enterprise.

The foundation should also include several non-traditional strategies and programs which are essential components of technology transfer activities which focus on economic and business development – including gap or proof-of-concept funding mechanisms, seed or venture capital programs, incubator management, stock/equity management, and related activities and initiatives. To fund these programs, important and creative funding decisions need to be made. There is an important distinction between support for these activities and the support received from the university for the management of university IP. For the latter, since revenue is not a primary consideration, the operational funds should not depend on revenue. For the former, more and more universities are creating investment funds tapping endowments, alumni angel investors, state economic development funds, and other sources. These activities should be managed by an experienced pre-seed or seed fund manager and measured by appropriate business performance metrics.

The second recommendation of the panel regarding organization is to assign each strategic function of the office leadership, with authority and budget that is appropriate to achieve the objectives, and matches contribution to mission.

For the management of intellectual property, the office has sufficient resources (6 professional FTE and patent budget of $82,848/fte vs. $25,375 national average for FY01). However, it needs an organization to provide rapid feedback to inventors and prospective licensees.

The panel offers a suggested reporting structure that will allow appropriate emphasis on technology transfer. The budget should follow this chart. The reporting structure can easily be transferred to the foundation when it is formed.
Directors should have signatory authority to a reasonable level and full access to general counsel. Performance reviews should be conducted regularly that review accomplishment against responsibility as articulated in job descriptions.

For the functions of economic development and entrepreneurship, we recommend a new position, the OTSP Director of Economic and Business Development, to coordinate activities for the UM System. To fulfill the obligations of the mission in this regard will require a full-time director, as well as a quarter of the executive director’s time. The panel recommends development of a university economic development strategy with buy-in from all participants in process.

We have recommended shifting the burden of negotiating IP provisions in research agreements to the Offices of Sponsored Programs. These offices will need to be empowered, either through select staff training or hiring, to negotiate difficult agreements.

Finally, we suggest the office consider a change of name to something that better projects the priorities of the office. Whether the office adopts a name such as Office of Technology Transfer and Commercialization, or Office of Economic Initiatives (or Economic Development), or another of its choosing, the intent is to convey a clear mission and a commitment to it.
Appendix A: Direct answers to the five focus questions of the statement of work

1. The University of Missouri System implemented a technology transfer operation that is centrally housed in Columbia but serves all four campuses (Columbia, Rolla, Kansas City and St. Louis). How successful is this model working for the University? Would you recommend changing to a less centralized structure? If so, what organization would you suggest?

The organization, as structured, requires a system wide effort to report to a campus VPR. While MU provides the largest campus contribution to the OTSP budget (39% of the budget for FY03, compared to 9% from the other campuses, and 52% from the system), it also generates the majority of tech transfer activity (62% of disclosures, 98% of licensing income, and 58% of deals in the past four years), and it has seen a very good return on its investment in licensing payments to the campus. This return can be expected to continue under new organization.

We recommend a reorganization to reflect the dual mission of tech transfer and economic development. The office should be reorganized to have an executive director reporting to the VPAA and campus research officers. Objectives should be matched to budget allocations and performance against those objectives should be reviewed monthly. The budget can be adjusted on an annual or semi-annual basis depending on flexibility of system. The organization can be implemented before a move to a research foundation.

Under this new model, the MU contribution continues to be larger than the contributions from other campuses, although the VPR for MU gives up a certain level of authority. Nevertheless, MU faculty will benefit more from the operations.

2. In a related issue, a decision has been made to locate a technology transfer office at UM Rolla, which reports to the central office. How would you suggest the two offices coordinate their activities? How separate should the offices operate? What should be the reporting lines?

The Rolla office should report directly to the central office because of access to budget, and ability to make decisions in negotiating licenses. Ultimately, this would smooth the transition to the foundation, which would have a board consisting of the four VPRs, with the VPAA as chair.

The University of Missouri Office of Technology and Special Projects serves three main functions: (1) Managing the protection and transfer of the university’s intellectual property; (2) Building the infrastructure for entrepreneurial activities of the faculty; and (3) Acting as a key liaison from the university to the statewide (and nationwide) economic development community. What is your assessment of how well those functions fit together in the context
of the University of Missouri? For example, are all three functions appropriate to put together in one office? Could the office be reorganized to better address these functions? Might they compete for resources (e.g., funds, staff time)? Essentially, do you have any recommendations for how the University of Missouri might alter the organization of these three functions to better serve the technology transfer needs of the faculty and the university's need to show evidence of driving economic development, or do you think the organization is appropriate as it stands?

While the question refers to three functions, we discerned a fourth during our discussions—a role related to evaluating and responding to IP-related provisions in sponsored projects contracts, material transfer agreements, and confidential disclosure agreements. We recommend that the campus-level Offices of Sponsored Programs be empowered to handle this, rather than the system-level OTSP. We perceived disharmony among the four identified functions, because of the conflict between perceived importance and resource allocation. At the same time, we can project a vision for the unit where the three functions meld together to advance the office, the campuses and the system: (1), IP management should be approached as a service function rather than a function for generating institutional financial resources; (2), The unit should catalyze an entrepreneurial culture on all campuses; and (3), The unit should direct efforts to economic development of the city and state by leveraging institutional resources.

With such an approach, measures of success could include faculty and staff satisfaction levels, number of inquiries about starting firms and number actually launched, and number of relationships facilitated or encouraged in the area of economic development.

4. Based on your conversations with faculty and staff and your examination of the University of Missouri's technology transfer operation, what do you see as the strengths and weaknesses of how the University of Missouri - Columbia manages intellectual property? Please include a broad spectrum of issues ranging from faculty culture and understanding, to technology transfer processes, to the flow of "deals" (e.g., licenses, start-ups, research agreements), to the mechanisms for nurturing technologies. What recommendations would you make to lessen the extent of any weaknesses given the context of the University?

**Strengths:**

- Even among those most critical, there seemed to be recognition of how much progress has been made within the last few years.

- OTSP staff are liked and respected – as individuals, and because of the array of technical backgrounds and disciplines represented among the staff. We recommend that this form of market domain expertise be maintained.

- For the disclosure, patenting and deal rates, the size of the staff seems appropriate.
• The leadership provided by the MU VPR was seen very positively; his commitment for continuing to improve the quality and impact of the technology transfer and economic development efforts was widely acknowledged.

• There is excellent and enthusiastic support from the local, regional and state business development and entrepreneurial support communities. This has been well-cultivated.

• Faculty outreach efforts described by staff seemed well conceived.

• The approach toward potential utilization of MU research space as “pre-incubator” space seemed very progressive and somewhat unique for a public university – and probably gives MU some strategic advantages compared to its peers in being able to more aggressively pursue business development activities while awaiting the launch of a university-affiliated incubator facility.

Weaknesses:

• The university environment is seen internally and externally as extremely risk averse – and more specifically as a place where fear of making a wrong decisions in this area leads to a lack of willingness to make any decisions.

• There is a lack of entrepreneurial culture and know-how within MU and its faculty. Faculty activities in this area are not recognized, promoted, or rewarded, and there is a lack of knowledge about how to proceed down this path or where to turn for assistance. Faculty claim to “not know” how to engage in the business development aspect of technology transfer.

• The policy infrastructure – particularly with regard to conflict of interest, equity acquisition and management, and the role of the legal office in this sphere of activity – appears to be lacking.

• The deal flow from the previous fiscal year (2 license agreements) is alarmingly low.

• The process for decision making regarding patenting, licensing, and agreement execution needs re-engineering.

• The staff are too constrained in terms of how far they can take a deal – they need more autonomy and flexibility within well defined and clearly communicated parameters.

• The invention management, financial, and marketing databases seemed to be either lacking or non-existent; information about disclosures, patents, finances, and deals seems much too difficult for project managers to obtain.
Recommendations:

- Streamline processes; re-define legal counsel’s role; standardize and publicize agreements.

- Provide staff with operating parameters for making decisions about patenting, licensing, and related aspects of the technology management process – and delegate much more deal making responsibility to them.

- Institute additional publicity mechanisms to send the message that participation in technology transfer and business development is encouraged, recognized, and promoted. These can complement the annual Technology Transfer Showcase, which recognizes faculty inventors, and names a Faculty Entrepreneur of the Year.

- The Provost, VPR, and related university officers should utilize their “bully pulpits” to advocate for the tenure and promotion processes to begin to develop mechanisms to recognize and reward success in the “fourth mission” of the university (i.e., economic development).

5. What would you see as the strengths and weaknesses of creating a research foundation in Missouri to handle intellectual property and relationships with industry (i.e. moving the technology transfer operation into a research foundation)?

Strengths:

- Sends a new message to the faculty and to the local, regional and state technology-based economic development communities that the University of Missouri is “open for business.”

- Tangible, dramatic strategy for pursuing university’s fourth mission of economic development.

- Helps deal with legacy, speed, and bottleneck issues by putting the function into a more “business-like function” able to deal in real time.

- Will shield the university and its endowment from some of the liability issues associated with technology transfer and start-up company development – which may be key in obtaining legal’s buy-in for the proposed change in organizational structure.

- Will greatly enhance the organization’s flexibility and ability to offer the broad array of programs and strategies necessary to support a successful start-up development initiative (including gap funds, pre-seed and venture type funds, incubator management, and related activities).
• Will provide a mechanism for professionally and strategically managing the equity portfolio derived from the university’s efforts to license its technologies to start-up companies.

Potential Weaknesses and Means to Address:

• Foundations can appear to be far removed and with insufficient regard for the teaching and research missions of the university – special efforts need to be pursued in organizing, managing and governing the foundation to guard against these perceptions.

• Foundations can be so focused on business success that they easily overlook the service aspects of the mission of a technology transfer function. For example, an appropriate technology transfer service-oriented action may be to license a technology at no charge if the public good or faculty member’s desires are well-served by such a strategy. A foundation focusing on business must take special measure to ensure that the service mission is not overlooked – and to see that success in such activities is rewarded as well as income generation, business creation, and similar measures.
Appendix B: Itinerary for site visit

Tuesday, September 30, 2003

1:30 p.m. – 3:00 p.m. Dr. Jim Coleman, Vice Provost for Research
University of Missouri-Columbia
Dr. Thomas R. Sharpe, Executive Director
Office of Technology & Special Projects (OTSP)
University of Missouri System

3:00 p.m. – 3:30 p.m. Terry Nixon, Associate Director, OTSP

3:30 p.m. – 4:00 p.m. Scott Uhlmann, Coordinator, Technology Collaborations & Licensing, OTSP

4:00 p.m. – 4:30 p.m. Marla Barrett, Administrative Associate
Judy Tayloe, Executive Staff Assistant
Robert Martin, Administrative Assistant
Margie Floyd, Senior Secretary

4:30 p.m. – 5:00 p.m. Wayne McDaniel, Sr. Licensing & Business Development
Associate-Physical Sciences & Engineering, OTSP

5:00 p.m. – 5:30 p.m. Charlene Boyes, Sr. Licensing & Business Development
Associate-Life Sciences, OTSP

5:30 p.m. – 6:00 p.m. Chris Fender, Sr. Licensing & Business Development
Associate-Life Sciences, OTSP

6:15 p.m. – 8:00 p.m. Dinner with OTSP Licensing Staff

Wednesday, October 1, 2003

7:30 a.m. – 8:30 a.m. Community Economic Development Leaders
Bernie Andrews, President, Regional Economic Development Inc.
Jake Halliday, President, ABC Laboratories, Inc.
Raymond Beck, City Manager, City of Columbia
Don Laird, President, Columbia Chamber of Commerce
Greg Steinhoff, President, Option Care, Inc.

8:45 a.m. – 9:15 a.m. Phil Hoskins, General Counsel’s Office

9:30 a.m. – 10:15 a.m. Dr. Henry White, Professor and Chair, Physics
Kathryn Nelson, Coordinator, Clinical Outcomes
Dr. Steve Alexander, Professor of Biological Science, Molecular Biology

10:15 a.m. – 11:00 a.m. Dr. Randy Prather, Professor, Animal Science
Dr. Jeff Phillips, Research Associate Professor, General Surgery
11:00 a.m. – 11:45 a.m. Dr. David Sleper, Professor, Agronomy

11:45 a.m. – 1:00 p.m. Dr. John Gardner, Associate Dean/Director of Research, Agriculture
Dr. Wynn Volkert, Professor of Radiological Sciences/Biochemistry

1:00 p.m. – 2:00 p.m. Bill Romjue, Executive Director, Missouri Biotechnology Assoc.
Frank Stokes, Regional Commerce and Growth Assoc., St. Louis
(Mr. Stokes will participate by telephone.)

2:00 p.m. – 3:00 p.m. Dr. Wayne Huebner, Vice Provost for Research
University of Missouri-Rolla

3:00 p.m. – 4:00 p.m. Chip Cooper, Missouri Innovation Center
Dr. Mike Nichols, Director, SBIR/STTR Assistance Centers

4:00 p.m. – 5:00 p.m. Dr. Ron MacQuarrie (Conference Call)
Vice Provost for Research, Dean, School of Graduate Studies
University of Missouri-Kansas City

5:00 p.m. – 5:30 p.m. Dean James Thompson, Engineering

6:00 p.m. – 8:00 p.m. Dinner – Site Team Only

Thursday, October 2, 2003

7:30 a.m. – 8:30 a.m. Dr. Steve Lehmkuhle Vice President for Academic Affairs
University of Missouri System

8:45 a.m. – 9:30 a.m. Dr. Rick Finholt, Executive Director Economic Development
University of Missouri System
Director, Missouri Research Park

9:30 a.m. – 11:30 a.m. Site Review Panel Discussion

11:30 a.m. – 1:00 p.m. Dr. Jim Coleman
Dr. Steve Lehmkuhle
Dr. Tom Sharpe
Appendix C: Sample invention and technology evaluation forms

C.1 Invention evaluation from the Georgia Tech Research Corporation Office of Technology Licensing

Invention Title: ________________________________________________

_________________________________________________________________

Inventor(s): ______________________________________________________

Check the response that best corresponds to your evaluation for each criterion. Note that “Don’t Know”, “Not Applicable” and “Informed Guess” responses are code “DK”, NA” and “IG”. Please use them when appropriate.

NOVELTY ANALYSIS:

SEARCHES

Have patent/literature searches been carried out -
YES/NO
If so, were they:

_____ Literature search by inventor _____ DK
_____ Literature search by others _____ NA
_____ Patent search in U.S.A. _____ IG
_____ International type patent search

SEARCH RESULTS

The patent/literature search results appeared to indicate:

_____ Complete anticipation of invention and know-how _____ DK
_____ Anticipation of invention but not know-how _____ NA
_____ Minor improvement on prior invention _____ IG
_____ Major improvement on prior invention
_____ Clear novelty for specific embodiment
_____ Completely novel – no prior art

PROTECTION

The prospects for patent or other protection appears to be:

_____ No legal protection or secrecy possible _____ DK
_____ No legal protection but some secrecy may be possible _____ NA
_____ Limited legal protection but some secrecy may be possible _____ IG
_____ May be patented and/or short term secrecy possible
_____ Can be patented and/or long term secrecy possible
BUSINESS RISK ANALYSIS:

Stage of Development

- Only an idea with drawings and/or descriptions  DK
- No Prototype  NA
- A rough prototype which demonstrates the concept but is not fully developed and tested  IG
- A rough prototype with performance and safety testing completed
- A final prototype with testing completed; minor changes may be needed

RESEARCH AND DEVELOPMENT

The research and development required to reach the commercial stage will be:

- Extremely difficult and complex  DK
- Relatively difficult and complex  NA
- Moderately difficult  IG
- Relatively easy and simple
- Very simple and straightforward

FUNCTION

Will the invention actually do what is intended to do?

- Don’t know  DK
- The concept is sound; cannot be made to work  NA
- It won’t work now but might be modified  IG
- It will work, but minor changes may be needed
- It will work, no changes necessary

COSTS

The amount of expenditure required for development to the commercial stage is expected to be:

- Greater than returns – should be dropped  DK
- Excessive – may not be recoverable  NA
- Heavy – probably recovery  IG
- Moderate – recoverable within five years
- Low-recoverable within two years
**PRODUCTION FEASIBILITY**

This invention will:

- Be impossible to produce now or in the future  [ ] DK
- Be very difficult to produce  [ ] NA
- Have some problems which can be overcome  [ ] IG
- Have only minor problems  [ ]
- Have no problems

**MARKETING**

The marketing of the invention (seeking a licensee) will be:

- Extremely difficult and complex  [ ] DK
- Relatively difficult and complex  [ ] NA
- Moderately difficult  [ ] IG
- Relatively easy and simple  [ ]
- Very simple and straightforward

**DEMAND ANALYSIS:**

**Potential Market**

The total market for the invention is likely to be:

- Very small – very specialized or local in nature  [ ] DK
- Small – relatively specialized or regional in nature  [ ] NA
- Medium – limited local and/or overseas market  [ ] IG
- Large – reasonable local and broad overseas market
- Very large – extensive overseas market

**Potential Sales**

Expected sales of the product of the invention might be:

- Very Small  [ ] DK
- Small  [ ] NA
- Medium  [ ] IG
- Large
- Very Large
**Demand Trends**

The market demand for the invention is likely to be:

- [ ] Rapidly declining – invention might soon become obsolete [ ] DK
- [ ] Declining [ ] NA
- [ ] Steady – Demand expected to remain constant [ ] IG
- [ ] Growing slowly
- [ ] Rapidly expending

**Life Cycle**

The life of the invention is likely to be:

- [ ] Less than two years [ ] DK
- [ ] Two to four years [ ] NA
- [ ] Five to seven years [ ] IG
- [ ] Eight to ten years
- [ ] More than ten years

**COMPETITIVE ANALYSIS:**

**Function**

Relative to competing products/processes, the performance might be seen as:

- [ ] Very inferior [ ] DK
- [ ] Inferior – offers no improvement [ ] NA
- [ ] Similar – Not noticeably better [ ] IG
- [ ] Superior – A noticeable improvement
- [ ] Very superior – A major improvement

**Durability**

Compared to competing products/processes, the likely durability is:

- [ ] Very inferior [ ] DK
- [ ] Inferior – Cannot be promoted as an advantage [ ] NA
- [ ] Similar – Not noticeably better [ ] IG
- [ ] Superior – Easily promoted as a major improvement
- [ ] Very superior
**Price**

Compared to competing products/processes, the price is likely to be:

- [ ] Much higher
- [ ] Higher
- [ ] About the same
- [ ] Lower
- [ ] Much lower

**Existing competition**

Existing competition for the invention appears to be:

- [ ] Very high – new entry will be difficult
- [ ] High – only a small market share likely to be gained
- [ ] Moderate – reasonable penetration expected
- [ ] Low – significant market share expected
- [ ] Very low – market dominance possible

**New competition**

Competition from new products/processes is expected to be:

- [ ] Very high – lead will be short
- [ ] High – lead will be relatively short
- [ ] Moderate – market share likely to be retained
- [ ] Low – relatively low lead
- [ ] Very low – likely to sustain large market share

**SOCIETAL ANALYSIS:**

**Legality**

In regard to relevant laws, regulations, standards, etc. the invention:

- [ ] May not meet them
- [ ] May require substantial changes to meet them
- [ ] May require modest changes
- [ ] May require minor changes
- [ ] Will meet them without any changes
**Safety**

The invention appears to be:

- [ ] Very unsafe
- [ ] Unsafe under foreseeable conditions
- [ ] Relatively safe
- [ ] Safe when used as intended, with no foreseeable hazards
- [ ] Very safe under all conditions, including misuse

**Environmental**

Use of the invention may:

- [ ] Violate environmental regulations or have dangerous environmental consequences
- [ ] Have some negative effect on the environment
- [ ] Have no effect on the environment if properly used
- [ ] Have no effect on the environment
- [ ] Have a positive effect on the environment

**IN Volvement of the inventor(s):**

The inventor(s) is likely to be:

- [ ] Uncooperative
- [ ] Helpful, but not effective
- [ ] Helpful and effective
- [ ] Helpful and effective with understanding of patent and commercial factors
C.2 Technology evaluation form from Virginia Tech Intellectual Properties, Inc.

A. Background:

VTIP’s mission is to identify, legally protect (patent/copyright), and market intellectual properties resulting from research at Virginia Tech which have the potential of becoming commercially attractive technologies. We are also charged with being financially self-sufficient after sharing royalties with the inventors according to the IP Policy.

To illustrate the relationship between disclosures and “bottom line”, the following may serve: We currently (since 1985) have about 664 disclosures, our issued patent portfolio is over 100 and we have approximately 85-90 licensed technologies. At this stage in our development, the “80/20” rule is much in evidence, that is to say 20% of the licensed technologies produce 80% of the revenues.

As a disclosure goes through the process, the amount of financial and human resources needed to move it to the next step in its development has a steep slope; typically a U.S. patent costs about $10K, and needs significant attention from both the inventors and VTIP; foreign patents cost $30-100K, licensee searches are often time consuming, as are negotiations, and inventor(s) input and cooperation becomes ever more important and time consuming.

The limited availability of these resources makes prioritization and targeting key steps in the process. Technology evaluation at an early stage can be extremely valuable in the implementation of these steps.

B. Objectives:

Early stage evaluation, especially as envisioned here, is usually more qualitative than quantitative; the aim is to gain a better understanding of the commercial potential of the technology, focusing on some of the key parameters, identifying major pluses and minuses including “fatal flaws” (if any), and provide guidance to VTIP (and CIT) in prioritizing commitment of resources.

C. Evaluation Criteria:

The following key parameters are suggested for examination during evaluation; the disclosure document addresses many of them but inventor expansion, independent confirmation, and evaluator assessment are usually necessary.

1. Stage of Development: This may range from conceptual (an idea with maybe some sketches) to essentially market ready (a fully developed, beta tested software package including complete user manuals, etc.). Both extremes are
relatively rare, and identification/definition of “next steps” is extremely helpful.

**Fatal flaws**: None, but very early stage disclosures (idea stage) usually have low priority.

2. **Development costs/time**: This refers primarily to commitments and investments which a potential licensee would have to make to take the technology from its present stage to final sale/use. Large costs/long lead times spell high risk and therefore require high potential rewards to arouse commercial interest. Also in this category may be such factors as the technology being dependent on a related development (technical, regulatory, political, etc.) and/or solving a problem which is not currently high priority but which may become so in the future.

**Fatal flaws**: None, but high risk situations require early exploration of specific licensee interest prior to significant further resource commitment.

3. **Technical merit**: This may range from a marginal improvement to an existing product/process on one end to a basic breakthrough which revolutionizes a technical field or industry on the other extreme. Evaluation of this factor should weigh towards understanding of the technology rather than determination of its importance, since at times a marginal improvement which offers an elegant (and inexpensive) solution to a nagging problem can be both easy to commercialize and relatively profitable.

**Fatal flaws**: None, but technologies at either extreme require more than usual depth of exploration of other evaluation criteria.

4. **Market Breadth**: This factor should be examined from two aspects, namely field of use and geographic. Narrow markets often have the advantage of relatively simple marketing effort but are usually not large. The evaluation also should consider the possibility that there may be multiple uses for the technology, above and beyond those suggested by the problem(s) the inventors set out to solve; experience indicates that the alternates often exceed the base in market potential. In evaluating this factor, any information regarding potential licensees (industries, companies, individual contacts, etc.) are extremely valuable.

**Fatal flaws**: None, but if combined with small market size will easily result in low priority.

5. **Market size**: If at all possible, this factor should be defined in terms of dollars. A precise definition is usually not readily feasible or necessary, order of magnitude, “back of the envelope” estimates (with bases/assumptions) are normally quite adequate at this stage.
**Fatal flaws:** Revenues (units sold x unit sales price) of less than $100,000 for technologies requiring patent protection.

6. **Inventor(s)’s attitude:** Throughout the commercialization process, which can take from a few months to several years, the inventor(s) have to be willing and able to “invest” time, effort, and skills in the activity, often with minimal (if any) short-term tangible rewards or benefits. Without such an “investment” a positive outcome is highly unlikely regardless of the technico-economic merits of the technology.

Determination of the degree of interest, attitude, and motivation of the inventor(s) towards the commercialization of a given technology is clearly subjective and rarely simple or clear-cut; it is, however, an area in which the contribution of the IPC evaluator may be both irreplaceable and extremely valuable.

**Fatal flaws:** An a-priori negative attitude towards the process, without the willingness to reconsider. An activity load such that no significant time can be made available in the foreseeable future; misguided motivation (e.g. “all I want from this is a patent in my publications list”).

D. **Information Sources:**

While the skill and experience of each evaluator will undoubtedly be the best guide as to where to go for the needed information, the following are some suggested sources:

1. The disclosure document.
2. Discussion with the inventor(s).
3. Discussion with references furnished by the inventor(s) in the disclosure document and/or in discussion.
4. Literature references.
5. Personal contacts of evaluator in the academic community (under confidentiality).
6. Personal contacts of evaluator in the industrial/commercial community (without revealing confidential details of the technology).
7. Tea leaves, Tarot cards, etc. are recommended only if all else fails!

Revised 5/2/96
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<th>Rating</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tr>
<td>Stage of Development</td>
<td>Concept</td>
<td>Simulation</td>
<td>Breadboard</td>
<td>Prototype</td>
<td>Market Ready</td>
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<td>Technical Development Costs/Time</td>
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<td>Medium Cost, Medium Time</td>
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<td>Low Costs, Short Time</td>
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<td>Business Development Costs/Time</td>
<td>New Market, New Manufacture, New Business</td>
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<td>New Market</td>
<td></td>
<td>Existing Market, New Customers</td>
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<td>Potential Interest of Market</td>
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<td>Medium Problem</td>
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<td>Important Problem</td>
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<td>Technical Merit</td>
<td>Marginal improve to existing Problem</td>
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<td>Product Platform</td>
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<td>Breakthrough-revolutionize industry</td>
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<td>Market Breadth</td>
<td>Small niche, oligopoly</td>
<td>Multiple applications</td>
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<td>Many large uses</td>
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<td>Market Size</td>
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<td>$10-20 Million</td>
<td>$50-100 Million</td>
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<td>Attitude of Inventor</td>
<td>Negative with no time</td>
<td>Positive but no experience</td>
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<td>Able and willing</td>
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<td>Patent Coverage</td>
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<td>Dominate US</td>
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<td>Dominate US, foreign or copyright</td>
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<td>IPC Rating</td>
<td>Low Priority</td>
<td>Needs Further Exploration</td>
<td>Should be Pursued</td>
<td>Very Promising Technology</td>
<td>Outstanding Commercial Potential</td>
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Draft IP Disclosure Evaluation Criteria
TECHNOLOGY EVALUATION WORKSHEET/REPORT

Disclosure No: ___________  Date: ___________

Evaluation Coordinator: ________________________________

Disclosure Title: ________________________________________________

1. Brief Description:

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

2. Stage of Development:

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

3. Development Costs/Time:

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

4. Technical Merit:

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
5. Market Breadth:

______________________________________________________________________________________________

______________________________________________________________________________________________

______________________________________________________________________________________________

6. Market Size:

______________________________________________________________________________________________

______________________________________________________________________________________________

______________________________________________________________________________________________

7. Inventor(s) Attitude:

______________________________________________________________________________________________

______________________________________________________________________________________________

______________________________________________________________________________________________

8. Summary of Evaluation:

______________________________________________________________________________________________

______________________________________________________________________________________________

______________________________________________________________________________________________

9. Disclosure Ranking (based on 8 above):

   Outstanding Commercial Potential   (5)_____
   Very Promising Technology          (4)_____
   Should be Pursued                  (3)_____
   Needs Further Exploration         (2)_____
   Low Priority                       (1)_____
   Fatally Flawed                     (0)_____
