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UNIVERSITY MANAGED TECHNOLOGY BUSINESS INCUBATORS: ASSET OR LIABILITY?

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University managed technology-based business incubators (UMTIs) have become increasingly popular. Some universities are forming private corporations and are encouraging professors/researchers to commercialize intellectual property (IP) based upon research conducted in their laboratories. The UMTI provides the infrastructure, access to high-tech laboratories, libraries, students and faculty, and a coalition of like-minded entrepreneurs. Universities face uncertainties when establishing UMTIs and need to minimize risk while maximizing benefits. This paper discusses results of a benchmarking study of eleven technology incubators and their risk mitigation policies. Experience with technology transfer and use of the UMTI as a living-laboratory for students is presented.

INTRODUCTION

Traditionally, universities and federal laboratories conduct basic research that contributes to underlying scientific understanding. However, the process of converting these research results to commercial products is most often left to the private sector. Recently, universities have seen the limitations of licensing technologies to industry and are forming private corporations from technology developed in their own laboratories. To facilitate this process administrators are providing professors/researchers release time to commercialize the IP developed in university laboratories. Regional UMTIs have created the infrastructure needed for high-technology business ventures and have located these UMTIs adjacent to the university. Benefits of this strategic decision include transfer and commercialization of technology (Phillips), creation of jobs for graduates, (McGee and Smilor), better utilization of university labs and facilities (Smilor and Gill), and economic development for the community (Kuratko and Thayer). However, universities must implement risk mitigation plans to ensure that incubators become assets and not liabilities. Although there have been a significant number of papers published on the growth and operation of technology business incubators (Mian, 1996, Mian, 1997, Allen and McCluskey), few if any have attempted to evaluate the potential risks and benefits a university must address when evaluating whether to establish a UMTI.

Fesser and Willard reported that while basic research still predominates in the academic setting, the transformation of basic research to commercially viable products is through profit driven enterprises. Phillips (2002) further reported that technology-based business incubators support growth through innovation and application of technology and the university provides the ideal setting for these incubators with access to advanced technology laboratories, equipment and other technical resources. Cybert and Goodman (1997) found that university linkages with businesses resulted in a forum for testing theories, refining technical skills and training and placing their students. George et al. (2002) evaluated the performance of publicly traded biotechnology firms housed external to UMTIs but with established links to universities versus firms without these links. They found that firms with established university linkages generated

more patents and had significantly lower research and development spending. They hypothesized that the university link provides virtual laboratories resulting in less cost than equivalent in-house research and development facilities.

The number of business incubators has increased dramatically since the 1980's as documented by the National Business Incubator Association (www.nbia.org, 2003). Their records (2003) indicate that there are approximately 950 business incubators in North American, a significant gain from 1998 (587 incubators) and 1980 (12 incubators). Evidence that the business incubator movement is gaining international importance was demonstrated at the most recent NBIA 17th International Conference in June 2003 (NBIA Update, 2003). During the conference, representatives of 17 national incubation associations convened and adopted an international definition of a "business incubator program": *"A business incubator program is an economic and social development process designed to advise potential start-up companies and help them establish and accelerate their growth and success through a comprehensive business assistance program. The main goal is to produce successful businesses that will leave the program in a timely manner, financially viable and freestanding. These graduates create jobs, revitalize communities, commercialize new technologies, and create wealth for local and national economies."*

In the United States, the mix of incubators is divided among mixed-use businesses (47%), technology firms (37%), manufacturing firms (7%), service businesses (6%) and the remainder in community or niche markets. Incubators are most commonly associated with academic institutions (25%), government associations (16%) or economic development organizations (15%). Only sixteen percent of the incubators are organized as a for-profit entity. Success rate of business incubator graduates has been impressive when compared to new business starts in general (NBIA 1997). NBIA recently reported that 87 percent of business incubator companies are still in business after leaving the incubator and 84 percent of those stay in the community.

The purpose of this paper is to present results of a benchmarking study, conducted in 2002, evaluating how eleven different technology-based business incubators approached risk mitigation Results of this benchmarking exercise were used by our university to develop operating protocol and lease language that would anticipate and mitigate potential risks. This paper will further address our experience with using technology incubators as a teaching tool and discuss the symbiotic relationship between the technology incubator and the graduate entrepreneurial business and technology program.

In order for universities to capitalize on the benefits of UMTI's without incurring undue liabilities, potential risks should be assessed and best practices for mitigating these risks should be explored. The next section suggests a path that others may follow in completing this critical task.

RISKS ASSOCIATED WITH ESTABLISHING UMTIs

The establishment of a UMTI is not without risks. Most incubators, regardless of type, receive annual operating subsidies; i.e., cash, grants or in kind support (NBIA 1997). A benchmarking exercise was conducted to evaluate the risks associated with forming a UMTI and how

successful business incubators mitigated those risks. Areas of risk evaluated were centered on academic, legal, health/personal safety, image, security, financial, information technology systems, environmental, medical and management issues. Business incubators for this study were selected based on type of businesses (risk), supporting organization and status of the business incubator at the time of the benchmarking exercise. We chose incubators managed by communities, universities (both large and small), community colleges and private for profit incubators. The rationale of choosing non-university associated incubators was to determine how they approached risk mitigation and to gain a "out of the university box" perspective.

A total of eleven different business incubators were included in this benchmarking exercise spread throughout the eastern seaboard states. As a benefit of the benchmarking exercise all participants received data from other benchmarked incubators describing their risk mitigation practices, however participant confidentiality external to the benchmarking exercise was maintained. Participants are described in general terms in this article. Two incubators were managed by community organizations, one was a for-profit high technology incubator and one community college incubator was selected because of their interaction with other regional incubators and their demonstrated excellence in the incubation of small software companies. The remaining seven business incubators were university based and were selected to give a broad spectrum in size, research grant monies and a concentration in the incubation of high technology companies. Of the eleven business incubators interviewed, three had medical schools associated with their university and two had formal arrangements for cooperation with area medical schools.

All incubators, with the exception of the for-profit organization, considered applicants if they had a formal business plan. However, best practices indicate that business incubators have written entrance requirements to provide a legal framework for admission. Many of the incubators require committed funding for a portion of the initial lease (i.e., secured by an officer of the company), defined sources of additional future funding and due diligence evaluation of the company's IP. Most incubators offered consulting to applicants denied admission to develop an acceptable business plan and financials for future entrance consideration. The for-profit incubator recruited clients and required a substantial equity share (at least 51%) in the business. University personnel who work with incubator residents or obtain a share of the company were required to sign conflict of interest forms.

Protection of IP is a predominant element of risk mitigation. Several of the incubators required a patent search to validate the uniqueness of client IP prior to admission. The majority of incubators relied on standard contract language in the lease agreement stating that the university would be held harmless in any IP legal action against the incubator company. In addition, all of the business incubators interviewed required their client companies carry general liability insurance.

Regarding leakage of IP from university to incubator or vice versa, all incubators required clients to maintain laboratory notebooks detailing their research (signed, witnessed and dated). Laboratories operating in the university proper required the same procedures. Any conflict could be resolved by following the path and timing of discovery. Most benchmarked incubators indicated that good technology transfer programs systematically handle the university intellectual

property and therefore mitigate the risk of leakage. The University Research Foundation and/or Ethics Committee were identified as appropriate university organizations to handle any disputes related to IP ownership. The for-profit incubator was the only organization interviewed that had a policy of signing non-disclosure agreements with their residents. All other incubators initiated policy of avoiding confidential information related to a resident's technology, unless it was absolutely necessary in developing a contract with the incubator client. Only then, with approval of university counsel, would they sign a non-disclosure agreement. In order to eliminate IP leakage between resident clients, most incubators do not allow companies in direct competition to have simultaneous residency in the business incubator.

In all cases, only one file was maintained on each client company and that file was under lock and key in the director's office. Access to financial records and other confidential information was available on a need to know basis. If financial records were kept on a computer system, it was a stand-alone system with records not accessible by any other computers. When annual progress reviews were performed, only the official board of directors was allowed to view the data and data was safeguarded.

All incubators gave their clients access to the incubator on a 24/7/365 basis. Best practices utilized swipe cards on external door locks to keep track of who had access to the building after normal working hours. Only a few of the incubators had shared laboratory facilities (scintillation counter, microscopes, low temperature freezers, etc.) and none reported problems with sample tampering. The policy of not allowing companies in direct competition simultaneous residency helped contribute to the safeguarding of samples. Most incubator laboratories were self-contained and shared areas were conference rooms, bathrooms, and break areas.

Residency applications included a section detailing the type of laboratory work to be conducted including solvent use, hazardous materials (radioisotopes, etc) and waste generation. Laboratory procedures were to conform to university regulations and most incubators had standard inspections (at least yearly) of the facilities by university personnel to insure policy compliance. The incubator routinely handled general waste. Special waste handling needs (radioactive waste, animal tissue, cell culture, solvents, biohazardous) were the responsibility of the client company and could be contracted to specialty vendors. All of the business incubators required general liability insurance coverage ranging between $1M and $5M depending on the risk profile of the client company.

Client companies are responsible for any hardware used in their incubator spaces (scanners, computers, printers, etc.). The incubators provided infrastructure (T1, DSL or ISDN services) for client companies. Most universities gave incubator residents access to general university intranet services (email, library services, etc.) however any Internet commerce needed to be conducted on an external server.

Investigational Review Boards (IRBs) are used to assess risks involved in using human subjects and in controlling cross-contamination between labs in the same facility. Most incubators with medical schools used internal IRB boards to review cases for both human (medical and social science) and research animals. Incubators reported little or no additional risks for running

medical related trials with incubator companies if the proper due diligence is performed by the university IRB.

None of the business incubators provided legal counsel to their client companies for either general counsel or IP filings (with the exception of the for-profit incubator). University general counsel was available for use by incubator manager for incubator business. University general counsel was also used for negotiations related to technology transfer from the university to an incubator-based company (either involving a faculty member or outright sale of the technology).

The majority of the business incubators provided a list of area service providers (attorneys, business consultants, accountants, bankers, etc.) to incubator residents and many posted these lists on their incubator intranet. However, it should be noted that each of these lists contained a disclaimer stating that the list is compiled from individuals who have previously provided service to incubator residents with satisfactory results. Many of the service providers on these lists provide some pro bono service to incubator residents (seminars, free consultations, referrals, etc.) and many also offered an additional discount (10 – 15%) for business incubator clients. For the service provider, this is a clever marketing strategy since business incubator companies have an excellent survival rate (typically over 80%) and many maintain their relationship with service providers post-graduation from the incubator.

Universities protect themselves from illegal client actions by clearly limiting the university's liability with a strong hold harmless clause in the incubator lease. The for-profit incubator requires that a management team member be appointed as a member of the company's board of directors and in this way, helps to protect their investment and prevent any illegal action from taking place. As a pre-requisite for admission to the for-profit incubator, the technology founder and typically leader of the company must agree to step down from the predominant management team position and serve as the corporate technology manager. The for-profit incubator management team appoints a recently retired corporate officer with business nurturing experience to assume the role of CEO and maintains that position until an equity event (sale, IPO, etc.) takes place.

TECHNOLOGY TRANSFER AND EDUCATION OPPORTUNITIES

Although universities conduct a significant amount of technology-based research, little of the potential commercial value is realized. Several factors contribute to this missed opportunity. First, although the faculty and staff conducting the research have strong technical backgrounds, they often lack the business skills necessary to link the innovative technologies to the marketplace. Secondly, a systematic process for commercializing the resulting IP is lacking in many institutions. This problem is particularly acute in regional universities transitioning from a primary teaching mission to an increased focus on technology-based research. Likewise, the university must readdress its criteria for promotion and tenure recognizing that the application of new technology is equally important as basic research. In this context, a UMTI offers a potential to commercialize this previously dormant IP in a manner that can benefit the faculty, staff, students, and university. The purpose of this section is to discuss our experience and to shed some light on a path that others may choose to follow.

During the past eleven years, we have developed an academic program in technical (or innovative) entrepreneurship. Our program has both teaching and learning, and practical experience components. The business incubator provides a "living laboratory" that brings together students and entrepreneurs in one physical location. Opportunities exist for students to observe, and/or to directly work on team projects for companies within the incubator. Internships and work-study assignments further enhance learning experiences. This is an ideal way for students to gain the real-world experience that complements their classroom knowledge.

Partnerships with business, industry, the professional community, and other business incubators have been an important factor in the success of our program. Successful entrepreneurs and small business owners participate in the classroom as mentors, role models and reviewers of student business plans. In some instances these business plans result in a pathway to technology transfer and commercialization of previously latent intellectual property. The example discussed briefly below helps to illustrate this potential.

A colleague in the biomedical research had conducted collaborative research on cholesterol lowering drugs. In concert with a local chemical company, a patent was filed but remained inactive because expensive pre-clinical research with animal models was required before a clinical trial could begin. The commercial value of the patent had not been established and the decision to move toward commercialization had not been made. Our experience suggests that this situation is not atypical. A cross-functional team (MBA, Ph.D. (Biotech) and MD/Ph.D. candidates) developed a business plan to commercialize this technology in our Innovative Entrepreneurship course. Regional biotechnology experts validated the merits of the business plan and gave preliminary quantification to the IP.

The chemical company was approached with a possible joint venture opportunity and decided to donate two additional patents to the university. The business model and detailed market and financial date were invaluable in establishing the commercial merits of this project. As a result a mutually beneficial outcome was realized. The company was able to donate three patents to the university through our Research Foundation receiving a tax advantage in addition to their community contribution. A new business was established in our business incubator sharing IP with the Research Foundation. Guidelines and lessons learned were established to assist other faculty should they elect to commercialize their IP. The university could realize a financial return since they share in the ownership of the intellectual property.

Relevant literature and the risk mitigation benchmarking study discussed earlier in this paper have identified opportunities for students to gain experience as interns or employees in incubated companies. Regarding our benchmarking experience, almost all of the technology incubators used students as employees. MBA students served in most incubators as business consultants and the for-profit incubator selected MBA candidates from three area universities to serve in a semester long co-op program. Two of the universities interviewed conducted undergraduate entrepreneurial business plan competitions with the winning company receiving seed money to start a business in the university incubator. Entrepreneurial business created through technology transfer from the university tended to use current and recently matriculated graduate students to move the technologies from concept to commercialization. Opportunities for faculty members to consult for high technology incubated companies is also mutually beneficial because the

companies benefit from the outside perspective provided by the faculty, the faculty members receive compensation for their contributions, and the real-world experience contributes to faculty development making their classroom discussions more exciting for their students.

Our experience also suggests that partnerships with non-university sponsored incubators create excellent learning opportunities for our entrepreneurship students. Our partnerships with external inventors, the Oak Ridge National Laboratories (ORNL), and Center for Entrepreneurial Growth at the Oak Ridge National Laboratories have resulted in two major benefits. First, students in our Innovative Entrepreneurship class have access to patents that can be evaluated for commercialization potential. Secondly, graduate student consulting teams have the opportunity to conduct projects with high technology startup companies. These benefits are illustrated with two brief examples below.

Enabled by our National Science Foundation Partners in Innovation Grant, "Expanding Innovation Opportunities in Tennessee", we were able to work with a local entrepreneur holding a patent for a biotechnology product. The grant provided funding for business and technical mentors. Two graduate students in our class in Innovative Entrepreneurship developed a comprehensive business plan to commercialize this product. The local entrepreneur benefited from the business plan that should accelerate his path to the marketplace while mitigating much of the risk. Students gained practical as well as theoretical knowledge through the course experience. All involved with the project were pleased when the business plan won the 2003 Tennessee Technology Development Corporation Student Business Plan Competition. This competition has been organized to promote entrepreneurship at Tennessee colleges and universities by encouraging submission plans of original business concepts, some of which may lead to the development of new businesses in Tennessee. This example suggests that graduate student teams studying entrepreneurship can contribute to technology transfer and the commercialization of intellectual property, and that partnerships with community members external to the university can be mutually beneficial.

One final example is offered to underscore the benefits of partnerships with business incubators that are external to the university. During the past semester graduate student teams worked with two high technology companies at the Oak Ridge National Laboratories Center for Entrepreneurial Growth. Since these companies are involved with the transfer of high technology from the National Laboratories, highly trained scientists and engineers often lead them. This creates two opportunities. First, the companies benefit when the graduate teams provide a comprehensive, systematic approach to identifying markets and suggesting marketing strategies. Secondly, when graduate student teams bring digital media skills to the project, they can often portray the fundamental concepts in digital animations that rapidly convey the benefits of the technical innovation to potential investors. This latter benefit may be extremely helpful to high technology startup companies seeking venture capital and the students benefit as well or as previously stated. Our experience suggests that partnership with high technology incubators can be mutually advantageous even when students do not have specific knowledge of the technical innovation itself. When instructors act as coaches and seek technical guidance from colleagues with technical knowledge in the field, students appear to experience accelerated learning. Further research is required to explore systematic ways to capitalize on the learning potential.

To support teaching and learning of the global dimension of entrepreneurship we are strengthening our international partnerships with universities who also manage incubators. By matching or "twining" these incubators we are establishing the mechanism to launch high-technology ventures in the markets that are best suited for their products. For example, certain United States developed biotechnology products may gain approval in Europe before they receive Federal Drug Administration (FDA) approval in the United States. In this case we might choose to launch the company simultaneously in our incubator and in the twin incubator managed by the Hochschule Bremen University of Applied Science in Germany. One benefit of this approach is that revenues can be generated in Europe to help fund the company's efforts, while FDA approval is obtained and other markets are established. Using this partnership we hope to open international learning opportunities for our students in technical entrepreneurship. We plan to report results of our experience along this dimension of international entrepreneurship in a future article.

CONCLUSIONS

Technology-based business incubators managed by the university present a myriad of options related to technology transfer, educational opportunities, community development, creation of wealth and jobs, and scientific freedom. Risk exposure for the university can be managed through the development of appropriate lease language and incubator operating protocol. The results of the benchmarking study presented in this paper identify best practices of participants related to university image, intellectual property, incubator security, health, environment and safety, information technology, medical subjects and legal services and resources. Our study recommends careful consideration of risks that might impact the UMTI and the university, and then use of best practices to develop the necessary contracts, agreements and operating procedures to mitigate or diminish those risks prior to building or opening a facility.

The UMTI provides excellent infrastructure for the transfer of technology for both on and off-campus sources. Our UMTI has benefited from collaborative efforts with local industry ranging from donations of patents to access to high-technology laboratories and personnel. The UMTI has also proven to be an excellent teaching tool. Our program in technology-based entrepreneurial business has utilized the university and other regional technology incubators as expanded classrooms of the university. Newly formed technology businesses have benefited from structured industry analysis, web-site design, potential marketing avenues and introduction of new technology such as digital animation to help describe complex biotechnology systems. The students have benefited from working with real-life business that in many cases have been built on cutting-edge technology. Cross-functional student teams created through agglomeration of business, technology and other graduate students are forced to quickly learn how to work as a team and interact effectively with other disciplines. The technology business incubators become living-laboratories where students convert theory into practice. Our experience suggests that this practical knowledge accelerates the students' learning and makes them more valuable employees for both existing businesses concerned with technical innovation and business expansion as well as new business ventures. We are currently enhancing the global dimension of our technical entrepreneurship programs.

The lead author upon request will provide references.