

Establishing a Technology-Based Business Incubator at a Regional University: A Conceptual Framework and Case-Study.

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Abstract

University managed technology-based business incubators evolved at major research institutions as a mechanism for university professors to pursue commercial applications of their research without having to resign their university positions. These incubators assisted the universities in retention of valuable faculty and also provided for the development of university intellectual property (IP) to a level where commercialization was probable. In addition to faculty retention and the potential for revenue from commercialization of IP, these incubators further developed the universities' reputations in producing cutting edge research. The physical proximity of the incubators to the universities is crucial because this allows easy access to university intellectual capital, equipment and skilled technical labor that enable fledgling businesses to survive and flourish. Many regional universities are adding an emphasis on research and community economic development to their primary mission of teaching. As a result they are establishing business incubators. The goals for these incubators include creation of an environment and culture for the establishment of student driven companies, improvement of commercialization of university intellectual property, enhancement of the ability to attract technology-based businesses and provision of a living laboratory for student to work within the entrepreneurial environment. Just as is the case for the traditional research universities, business incubators at regional universities provide the supporting infrastructure that permits the university faculty to take advantage of SBIR and STTR programs to launch businesses and move university IP toward commercialization. In addition, the formation of a university-managed business incubator provides an excellent environment for non-university established technology businesses to benefit from the advantages of university faculty, personnel, students and graduates in both consulting and employee positions. Establishing a university managed technology-based business incubator at a regional university requires a strategic vision that integrates the universities core competencies, academic and research missions, senior administration concerns, capital and building campaigns and economic development concerns of the surrounding communities. This paper proposes a conceptual framework for building the strategic vision, developing the necessary infrastructure and mitigating risks when establishing the incubator. In addition, a discussion of lessons learned through the establishment of our university managed technology-based incubator at ETSU is presented through a mini-case study.

Literature review

The number of business incubators is growing in the United States and Europe according to information presented by the National Business Incubator Association (NBIA). NBIA records in

2003¹ indicate that there were approximately 950 business incubators in North American, a significant gain from 1998 (587 incubators) and a substantial increase since 1980 (12 incubators). A report from the 2002 NBIA conference in Toronto, Canada² noted a similar trend in Western Europe with over 900 business incubators reported, a significant increase since the first reported incubator in the late 1970's. Evidence that the business incubator movement is gaining international importance was further demonstrated at the NBIA 17th International Conference in June 2003¹. Attendees from 35 nations traveled to the Conference and non-US attendees comprised 37 percent of the conference attendance. 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 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. The success rate of business incubator graduates reported by NBIA has been impressive when compared to new business starts in general. NBIA recently reported that 87 percent of business incubator companies are still in business after leaving the incubator and 84 percent of those graduates stay in the community and continue to contribute to the economic development of the area.

The early technology-based business incubators established in the United States were founded at engineering research institutions such as the Georgia Institute of Technology and Rensselaer Polytechnic Institute. These universities established technology-based business incubators as a mechanism for university professors to pursue commercial applications of their research without having to resign their university positions. In this way universities were able to retain valuable faculty, provide for the commercialization of intellectual property and develop a reputation for cutting-edge technology that benefited the university and their graduates. In addition, because of the research intense nature of these institutes, the incubators were filled with businesses stemming from "home-grown" intellectual property.

University-managed business incubators are now evolving on regional university campuses as these institutes move from a primarily teaching emphasis to one including research and service elements. Many of these institutions (typically state funded) do not have the resources either through endowments, research funding or alumni support to fully fund the establishment of a business incubator and must find ways to creatively utilize space or assets to achieve their objective. Unlike the research intense institutes mentioned above, regional university incubators must not only promote the commercialization of internal intellectual property but also find ways to attract external technology-based businesses to seek residency in the facility.

A technology-based business incubator (ETSU Innovation Laboratory) was established at East Tennessee State University in 2002 as a component of the university's strategic vision and mission. It is the intent of this paper to review steps taken by ETSU that made the creation of a business incubator on our campus a reality and that this information may serve as a mini-case study for others wishing to pursue a similar path. Elements achieving the establishment of a business incubator include defining strategic intent (senior administration buy-in), establishing a university research foundation, risk mitigation procedures, marketing the incubator, utilization of the incubator as a teaching tool and opportunities for interaction between the university faculty and incubator residents.

Conceptual framework

This section suggests a conceptual framework for establishing a business incubator and a university research foundation. The steps outlined here are discussed in some detail in the remaining sections of this paper. Lessons learned at East Tennessee State University when applying this framework are also briefly discussed in terms of a mini-case that is included in this article.

Step 1: Develop a Strategic Vision. The shared strategic visioning process helps build consensus between the administration, faculty, staff, and students. Primary benefits that merit consideration are economic development, mutually beneficial commercialization of research and scholarly activities, and the opportunity to keep the best business concepts and students at home.

Step 2: Identify Risk Mitigation Plans. Conduct a benchmarking study to identify major risks and best practices for avoiding these risks. For state universities, the loss of sovereign immunity afforded to State entities is often a major concern. This concern is further exacerbated for biotechnology and other high technology incubators. However, universities are generally willing to share their best practices for mitigating these and other risks.

Step 3: Establish a University Research Foundation. Once a consensus has been established and plans for mitigating major risks have been outlined, establishing a university research foundation becomes the fundamental enabler for creating a business incubator. The university research foundation provides the vehicle for separating the academic and non-academic components of the joint venture. This is especially important when establishing the financial management processes and procedures that isolate state funded university activities from the new business ventures that are nurtured in the business incubator.

Step 4: Establish and Operate the Business Incubator. The first three steps in this conceptual framework provide the foundation for the creation and operation of the university related business incubator. Organizationally the director of the business incubator should report through the university research foundation that is most likely a not-for-profit [501 (c) (3)] corporation established to enhance the research mission of the university with which it is associated. A board of advisors is helpful in providing guidance to the director of the business incubator. The director should be a seasoned professional able to identify mutually beneficial ways of working with the client companies, the university and the community.

Developing a strategic vision

Like many businesses, ETSU faculty, staff and administrators developed a document containing

vision, mission and purpose statements, supporting values and strategic goals for a defined period (5-year) of time. These documents are maintained, modified and updated as the needs of the University change over time. In 1996 the University began reshaping our strategic plan to focus on eight key processes and to place an increased emphasis on quality and continuous improvement. One of these key processes was Research and Scholarship and we established goals and measures to transition from primarily a teaching university to one that placed an appropriate balance between teaching, research and service. Along our service dimension we also increased our commitment to support economic development throughout our region. Specific goals were set to improve the number of grants, quality of publications, and number of students involved in research projects. One measure of our accomplishment is that this past year we received \$ 36 million in external funding which was a three-fold increase since 1998. These increased strategic commitments to research and economic development created a favorable backdrop for establishing a technology-based business incubator.

Our most recent document states: “Research and scholarship are essential components of the University’s mission. The University supports quality research and scholarly activities in all areas of its academic programs and community service activities. These programs enhance the contributions of East Tennessee State University’s partnerships and collaborations. ETSU’s faculty is responsible for developing and maintaining programs of scholarly activity appropriate to their disciplines. The University seeks to reward practicing researchers and scholars who are current and active in their disciplines and who incorporate the products of their research and scholarship in teaching, professional publications or exhibits or performances, and in professional services to business, education, government, the arts community and health care systems”³. Strategic goals, developed by the University Strategic Planning Committee for a five- year planning cycle, supported the concept for the establishment of a technology-based business incubator. Specifically, goal two for ETSU’s 2000 - 2005 planning cycle states: “Conduct faculty and student research, scholarship, and creative activities that: (a). Strengthen the learning environment, (b). Enhance the region and (c). Advance human knowledge.” Through acceptance of this goal the university administration acknowledged the impact that a technology-based business incubator could have on the extension of university research, the development of new technology intensive businesses as potential employers for our graduates and in enhancing economic development of the region through the establishment of value creating sustainable industries.

When establishing a regional university supported business incubator it is important to gain approval of the concept by university stakeholders (faculty, deans, chairs). This should be accomplished by establishing that the business incubator is a continuation of and supports the mission, vision and strategic goals of the university. The importance of this step is highlighted in a benchmarking report regarding business incubation in Europe⁴. They noted that successful business incubators “should be designed to support and be part of a broader strategic framework – either territorially oriented or focused on particular policy priorities or a combination of these factors”. In our case, there was agreement that a technology-based business incubator would further the research efforts and economic development of our region but limited budgets and capital priorities made the establishment of the incubator a long range goal. It was only through the serendipitous availability of a piece of property, the application for and receiving of a

development grant and hard work by a core group of individuals that made the business incubator a reality at ETSU.

It is also imperative that the scope of the business incubator be defined in the early planning stages. In the case of ETSU, we wanted an incubator that would foster businesses derived from intellectual property (IP) created from university sponsored research, businesses licensing technology from other sources (Donations from Industry, National Laboratories, other Universities' IP, etc) and/or attract regional technology-based businesses that would benefit from being housed in a technology-based business incubator. By defining the incubator as technology-based, entrance criteria can be established and businesses not meeting the pre-defined business description (i.e. internet retail, service-based businesses, low-tech manufacturing, etc) can be directed to alternative facilities or organizations.

Establishing a university research foundation

Another step necessary for the establishment of a successful business incubator at a state-supported regional university is the establishment of a Research Foundation. A number of universities, particularly public universities, have found it advantageous to create separate Research Foundations. A University Research Foundation (URF) is a not-for-profit [501 (c) (3)] corporation established to enhance the research mission of the university with which it is associated, and often to facilitate economic development in the region and state it serves.

URFs exist to accomplish at least two functions: (a). encourage acquisition and facilitate management of grants and contracts and (b). promote the transfer of intellectual property developed by university personnel to the marketplace.

URFs are subject to federal and state laws governing non-profit corporations, but are not subject to all of the regulations and policies that impact a state institution. This permits the URF to interact with potential partners in ways that might not be possible for a university. For example, the Old Dominion University Research Foundation was able to assume operation of the NASA-Langley Wind Tunnel when the government wished to either privatize this resource or close it. As a state university Old Dominion could not have contracted to operate this facility because of liability issues and personnel concerns. The Old Dominion URF was able to contract to run the facility and the consequence has been preservation of jobs in the Hampton Roads area, access to a teaching and research facility for ODU, and increased opportunity for grant and contract money.

URFs can also partner more easily than state universities with industry in joint ventures. For example, in April of 1998 the URF at Virginia Tech (Virginia Tech Intellectual Properties, VTIP) entered into a partnership with a private computer software firm which merged the capabilities of Virginia Tech's computerized visualization laboratory with those of the private company to form a for-profit corporation called Virtual Prototyping and Simulation Technologies (VPST). The private company and VTIP each contributed money to capitalize the venture and will share 50/50 in the profits. The potential benefits to Virginia Tech are enhanced capability to train students in state-of-the-art technology without buying it and increased financial support for its research and teaching missions as income from VPST flows through

VTIP to Virginia Tech. The potential benefits to the area surrounding Blacksburg and to Commonwealth of Virginia are increased numbers of high-tech jobs and enhanced attractiveness to other technology-based or dependent companies seeking sites to begin business or for relocation.

University/industry research and development (R & D) partnerships can be win-win situations. The benefits to the industrial partner can be: (a) lower cost for high risk R & D because industry can tap into the basic research that university researchers do anyway; (b). access to equipment and facilities unique to the university setting; (c). access to faculty and student expertise and to established research teams; and (d). neutral site for collaborative R & D.

The benefits to the university can be: (a). increased support for basic research; (b). real-world challenges for faculty and students; (c). employment potential for students both because of project support while they are in school and the opportunity to gain contacts within industry; (d). access to equipment and facilities unique to the industrial setting; (e). access to proprietary research; and (f).enhancement of entrepreneurial activities.

However, for industry the adage “time is money” is not a platitude. Particularly in the biotechnology industry the ability to move quickly on a research project is often a deciding factor in maintaining funding. From the initiation of contract negotiations to execution of the project industrial partners are not often willing to accept the glacial time scale that characterizes the typical state university action cycle.

During the negotiation phase a URF can speed development of a contract in part because the personnel employed by the URF to do the negotiation are focused on this job and are not doing it as extra duty in addition to, for example, teaching or university administration. This enables quicker resolution of conflicts over costs, deadlines, intellectual property, publication rights and so forth. Also, because URFs have a broader license to operate under state law, they can agree to certain aspects of a contract that the university could not and this will speed the process. For example, a company will not always bow to certain state regulations such as those that prohibit the university from signing contracts that contain clauses requiring the university to indemnify and hold harmless the company.

Once the contract is signed it is imperative that work begin. Equipment may have to be purchased and personnel hired. URFs typically manage all aspects of the post-award process. This includes not only grant and contract accounting, but also procurement of equipment and supplies, and hiring of personnel for projects. Because URFs are private corporations they are not bound by the same regulations that sometimes limit the ability of a state university to move quickly in purchasing. For example, in the State of Tennessee any item defined as equipment must go out for bid.

Principal Investigators (PI) often find that this process unduly slows their progress and may retard it to the point of preventing the P.I. from meeting deadlines. This can happen with either federal or private funding. An URF can define things such as equipment in keeping with agency or contractor guidelines, rather than State regulations. An URF also has much more flexibility to

sole source at specialty equipment items then does a state institutions purchasing department. This capability facilitates the ability to meet deadlines.

As private corporations URFs can expand or contract the workforce they employ more quickly than can a state university. Support personnel for managing the fiscal components of grants and contracts are not usually supported by the direct funds supplied by the grant or contract and therefore must be supplied by the institution that receives the award. Therefore, if there is a sudden increase in grant and contract activity either the additional workload must be borne by existing university personnel or additional staff must be hired. In most state systems there are both financial and procedural limitations on creation of new positions that do not permit rapid accommodation to sudden changes in demand. For example, personnel policy might require that new full-time positions can only be requested and approved during specific parts of the budget cycle and that temporary employees can only be hired on six-month contracts which can only be renewed one time. These policies can limit the ability of the university to respond in a timely manner to increased demands on its resources if extramural funding suddenly increases. Most URFs provide the fiscal support for grants and contracts and can respond more quickly to changing demands on human resources.

Most, if not all, URFs also manage technology transfer for their associated universities. Indeed several URFs were first established to provide an efficient and effective means by which discoveries, inventions, processes and work products of university faculty, staff and students can be transferred from the university to benefit the public. The Wisconsin Alumni Research Foundation (WARF), the Purdue Research Foundation (PRF), and the University of South Florida Research Foundation are examples of URFs that were established to facilitate technology transfer and manage royalty income from successful efforts to license the intellectual property created by university personnel.

URFs maintain expertise in technology transfer not usually provided by the university. This expertise ensures more successful discovery of private partners interested in licensing intellectual property and bringing it to market than would otherwise occur. Additionally, while even many of the older and larger URFs (e.g. PRF) do not usually provide the direct legal services to pursue patents, they maintain relationships with, or even retain successful intellectual property attorneys to whom they can turn quickly when a potential patentable idea is presented. Many states require approval at several bureaucratic levels before an external attorney can be retained. A lengthy approval process for securing representation to seek patent protection has at least two potential negative consequences that can be avoided by a URF. First, faculty need to be able to publish their work because of responsibility to their profession and to meet university requirements. If the work is patentable it can not be published without jeopardizing the patent. The longer the delay in filing for patent protection the longer the delay in publishing the work. Second, competition to bring new products to market is sharp, particularly among biotechnology companies, and a delay may mean losing the novel nature of the work. Novelty is one of the criteria for obtaining a patent and certainly a primary requirement of a marketable product.

The ability to attract and retain talented research faculty is obviously key to the success of the research mission of a university. Old Dominion University has been able to hire national and world-class researchers during the past 25 years and has experienced substantial growth in

research during this period. This growth has had a positive impact on economic development in the Hampton Roads area of Virginia. Mr. Bob Wolfson, executive director of the Old Dominion University Research Foundation, indicates that the presence of the ODU Research Foundation has significantly increased the attractiveness of ODU to potential faculty. The benefits of the URF given above are the reasons for this. Researchers want to do research, not spend time coping with what they perceive as hurdles created by university bureaucracy. The URF is there to facilitate what researchers want to do and researchers appreciate the increased support for their efforts provided by URFs. In turn, higher quality research faculty generate more grant and contract revenue, which provides resources to support all aspects of the university mission.

Risk mitigation

Prior to establishing ETSU's business incubator, the university conducted a benchmarking exercise with eleven different technology-based business incubators located on the eastern seaboard. Results of this benchmarking exercise have been reported in a previous article⁵. The university wanted to evaluate the potential risks of operating a business incubator and these included university image, loss of a lawsuit associated with intellectual property, maintenance of security within the facility, environmental/safety risks, maintenance of information technology systems, medical risks (for human subjects) and the potential for the university to be involved in a lawsuit for any number of reasons. The most successful outcome of this exercise was the identification of policies and procedures that have been proven successful at established technology-based business incubators to assist in the operation of these facilities and in the mitigation of risks involved in operating such facilities.

Through our benchmarking efforts and collaboration with other universities operating business incubators, we were able to develop procedures to assist in the operation of the incubator and a lease agreement that client companies sign. These efforts have helped to minimize the exposure of the university to many of the risks that we investigated. This, in combination with the establishment of the Research Foundation, provided the structure to isolate the university from potential legal problems and for the facilitation of technology transfer and intellectual property protection.

We suggest that regional universities interested in establishing a university managed technology incubator share with and collaborate with established incubators in order to learn from their experience and procedures that they have in place to operate their facility. This is one place where the NIH (not invented here) syndrome should be avoided. ETSU would welcome any inquiries or visits from interested parties to share our experiences to date.

One concern that we specifically addressed in our benchmarking exercise was how do incubators become self-sustaining, that is generate enough cash flow to cover maintenance on the facility, repayment of debt, administrative and marketing costs and/or other operating expenses. Data from the literature and results from the benchmarking exercise (conducted in 2001) suggest that 30,000 to 40,000 square feet of leaseable space is required in order to have a self-sustaining business incubator however, some literature suggest that there is a trend for smaller profitable incubators⁶. The responses from the benchmarked facilities were interesting and varied, but tended to reflect the university administration's view on the specific purpose of the university

managed business incubator. This point reflects on the importance of having a strategic alignment between the business incubator and the university's strategic goals. Most of the incubator personnel interviewed during the benchmarking exercise indicated that the incubator received some university assistance for maintenance of the facility but were able to meet staff payroll and other expenses incurred in operating the facility through lease payments by the tenants. Conversely, several of the facilities stated that they never expected the facility to operate in the black and that their state governments viewed the technology business incubator as a way to generate jobs, retain high-tech graduates in the region, attract high potential companies to the area and provide an outlet for their own technology transfer from research conducted within their university.

It is important to have a clear understanding of what expectations the university administration has regarding the self-sustainability of the university managed business incubator and the time frame associated with achieving the goals that they set forward. Realistic modeling of incubator fill-out time and expected revenues can help to establish appropriate expectations of the viability of the business incubator and the potential downside that must be met prior to the incubator becoming self-sustaining or operating at a manageable loss.

Case study: The making of a research foundation and business incubator at East Tennessee State University

The purpose of this mini-case study is to shed some light on a path that others may choose to follow. Although the challenges and lessons learned discussed here were based upon the experience of a regional university, the authors believe that they are generally applicable to most institutions of higher learning.

The first recommendation that East Tennessee State University (ETSU) establish a University Research Foundation (URF) was made in the "Turning Toward 2011" report issued in 1986. The concept lay dormant for more than a decade until faculty from the Quillen College of Medicine approached the Associate Vice President for Research (now called the Vice Provost for Research) in 1997 with a request that he consider formation of a URF. In 1999, supported by the newly appointed ETSU attorney, the Associate Vice President began to develop the concept and drafted a white paper that presented the URF concept.

There was initial resistance and opposition to the proposal. Some faculty and administrators, questioning the reason for a URF, objected to the proposal. Their concerns were focused in two areas: (1) without the protection of the sovereign immunity afforded to State entities the URF would be exposed to additional liability, and (2) the financial base from which the URF would operate was uncertain. Within one year the majority of issues raised by the campus community were discussed and a consensus favoring establishment of the URF was achieved. A proposal for the URF was presented to the Tennessee Board of Regents (TBR) by the Vice Provost for Research and Sponsored Programs. The Office of the General Council of the TBR was not initially supportive of the proposal and two years of negotiations elapsed before the proposal for ETSURF (ETSU Research Foundation) was accepted.

By-Laws, a Charter for incorporation within the State of Tennessee and a Letter of Agreement Between ETSU and ETSURF were approved by the TBR and ETSURF was incorporated on July

10, 2002. TBR approved the Agreement between ETSU and the ETSURF on September 30, 2002. This is significant because ETSURF became the first URF in the TBR system. ETSURF was granted [501 (c) (3)] status by the IRS in July 15, 2003. The primary support from ETSU for establishment of ETSURF was in-kind. Early in its existence, ETSURF developed several revenue streams that resulted in the only cash contribution required from ETSU was the fee for incorporation within the State of Tennessee. Current funding sources for ETSURF activities are presented in a later section of this article.

The mission of ETSURF is to support research, scholarly and artistic activities at ETSU. ETSURF is the administrative and fiduciary entity for the ETSU Innovation Laboratory, manages ETSU intellectual property, and accepts and administers selected contracts and grants from private industry, foundations and other non-governmental agencies.

ETSURF is designed to be able to respond quickly and efficiently to opportunities for research support when the university, as an arm of the State of Tennessee would be limited by State regulations. Examples include making business decisions such as accepting a patent donation or in some cases accepting contract terms and conditions that would be excluded in a traditional state contract.

In retrospect four primary driving forces have shaped the research foundation at ETSU: (1) need for faculty to close contracts and grant applications quickly without impediments created by university bureaucracy; (2) management and transfer of intellectual property (IP); (3) management of the Innovation Laboratory, and ultimately the entire Innovation Park, without the barriers and constraints imposed by government bureaucracy; (4) need for a marketing entity for enhancing university partnerships with the private sector.

The foundation is governed by a Board of Directors (currently 13 members) consisting of two distinct member groups. The first group, and majority of the board members (nine members), are ETSU employees and include the ETSU President, Provost, Vice President for Health Affairs, Vice President for Finance, one dean exclusive of the Dean of Medicine (who is also the Vice President for Health Affairs), three faculty members, and the Vice Provost for Research who currently is also the Executive Director of ETSURF. The remaining four directors are individuals not employed by the university with expertise in the fields relevant to the business of the foundation. The president of ETSU acts as the Chairman of the Board. The officers of ETSURF include Chairman, Secretary, Treasurer, President, and Executive Director. The Executive Director serves as chief operating officer for ETSURF and exercises general control and supervision of all of its and is the management authority for the Innovation Lab.

The position that the Executive Director of the ETSURF holds as Vice Provost for Research and Sponsored Programs for ETSU demonstrates the University's contribution and commitment to the Research Foundation and its mission. The connectivity with the university is also reflected in the organizational structure as two-thirds of the board members are members of the university and one-third are community members. This reflects that promoting economic development is part of the mission of the Research Foundation.

Additionally, the Innovation Laboratory manager reports to the Executive Director of ETSURF and is responsible for the management and the operation of the innovation laboratory. It has been recommended that this position be added to the Board of Directors of the ETSURF. Specific lessons learned in the formation and initial operation of ETSU Innovation Laboratory (technology based business incubator) are discussed later in this mini-case study.

The structure of ETSURF as a 501(c)(3) organization does permit establishment of wholly-owned for profit subsidiaries under its control. This may become necessary as management of the Innovation Laboratory and ultimately the Innovation Park becomes more complex.

The key success factors influencing the success of the ETSURF can be summarized in the integrated approach aligning (1) a compelling vision demonstrating value to stakeholders; (2) sound performance measures and management methods; and (3) excellent operational execution skills in an effective business design.

The initial concept included people with a long-term commitment to the university as well as an outstanding reputation for achievement representing the optimal value dimension for setting up the leadership team of the new entity. Support from senior leadership of the university was critical in realizing the vision of ETSURF.

Since its founding in 2002 ETSURF has accepted and administered more than a dozen contracts, received a \$1,000,000 grant from the EDA to expand the facility, accepted donation of 2 patents and has filed for 3 patents, received a substantial gift from a private sector donor, successfully managed the ETSU Innovation Laboratory, and provided financial support for the Appalachian Student Research Forum. Despite these successes a number of challenges and opportunities confront ETSURF, its Executive Director and its Board of Directors.

The primary challenge is development of additional financial support for ETSURF. One critical issue for the future is how to diversify and optimize ETSURF's funding. In general, operating funding for an URF comes from the following sources.

(1) Royalties from licensed intellectual property owned by the URF. Currently for ETSURF this funding stream is focused on medical, biochemical, or pharmaceutical IP and can lead to neglect of applied research in business and other areas. The critical question to address is the issue of an optimized research portfolio supported by ETSURF, focusing on all areas of university research. The next question to address is the time period on how long a patent (and the market demand for the product) will remain interesting enough for a company to license this patent and whether the patent pipeline is sufficient enough to support a long term vision.

(2) Donations from alumni and industry partners supporting the URF.

(3) Administrative service charges on contracts and grants administered through the URF. This is currently only a small source of income for ETSURF and must be expanded.

(4) Rental income from companies that occupy real estate managed by the URF. This is a major source of revenue for ETSURF and will expand with the completion of the new addition to the Innovation Laboratory. .

(5) Premium in selling equity stakes that may have been taken in Innovation Laboratory client companies if they become successful, particularly if they have a successful Initial Public Offering (IPO). This an area of opportunity currently not exploited by ETSURF.

(6) Indirect or co-funding from the university through sharing human resources employed by the university with the research foundation. This is the primary source of ETSU support and is vital for operation of both ETSURF and the Innovation Laboratory.

The financial challenges must be met without compromising the mission of ETSURF to support ETSU research, teaching and service. Because one major responsibility of ETSURF is to provide management of the Innovation Laboratory and ultimately of the entire research park there is a danger that it will shift its focus, albeit unintentionally, to property development and improvement. While ETSURF can and should serve the local community as one additional source of economic development its leadership must continue to hold it to its essential mission.

Next the lessons learned in establishing ETSU's Innovation Laboratory (business incubator) are briefly discussed to provide suggestions for others who may choose a similar pathway.

Marketing of the business incubator

Since the inception of the business incubator at ETSU in 2002, a total of seven different clients have had residency in the facility and currently five remain. Of the initial seven clients, only one was a result of research that had been conducted in part by our university. In this case, the knowledge and resulting intellectual property was the output of a joint research project between a large chemical manufacturing company and ETSU's Quillen College of Medicine. The chemical company determined that the patents were not a strategic fit for them and donated them to ETSU through the Research Foundation. The donated patents gave way to a startup company, founded by the ETSU research scientist that was part of the initial joint research project, housed at the business incubator and funded by a PFI grant from the National Science Foundation and a STTR grant from the National Institutes of Health for the further commercial development of the donated intellectual property. The other clients were introduced to the facility through professional and personal contacts from the community, University and/or the College of Medicine.

With plans for expansion of the facility to approximately 30,000 square there is a need for additional clients and a marketing plan to attract the right type of businesses. We anticipate that these new business will be identified through three distinct mechanisms. When the business incubator was envisioned, imbedding an office of the Tennessee Small Business Development Center (TSBDC) in the incubator was central to the plan. The Tennessee Small Business Development Center assists individuals with a small business concept to develop a business plan and evaluate the potential viability of the proposed business. Businesses that are a potential fit with the technology incubator can be pre-screened and recommended to the director of the business incubator for possible admission. Residents of the incubator and clients of the TSBDC attend programs designed to assist startup businesses with information related to education, counseling and business support services. In addition the TSBDC is a permanent resident of the facility and pays for a share of the operating expenses. Secondly, the incubator has an excellent location that is in close proximity to the University, medical school and the regional medical center. Workshops and graduate classes in entrepreneurship are offered at the business incubator and to remote locations through telecommunication. As more professors and graduate students realize the opportunity that SBIR and STTR grants provide, the probability of more "home

grown” intellectual property being transformed into commercial ventures will become a reality. For example, recently two doctoral candidates in biochemistry completed a graduate course in Innovative Entrepreneurship and are planning to launch a biomedical company at the business incubator. The presence of the incubator and courses in entrepreneurship provided the impetus for these students to pursue this course.

Finally, ETSU became a founding member of the MountainSouth Incubator Alliance that was recently formed during the summer of 2004. The purpose of the alliance is: “To share best practices, jointly promote entrepreneurship and business incubation across the region, and generally cooperate to help achieve the goals of the member incubators.” We anticipate that new business will be generated for the ETSU incubator through the alliance as each member incubator will support a unique niche and clients will gravitate to the incubator that best fits their individual needs. ETSU’s niche of biotechnology, medicine and information technology is supported by the availability of skilled student labor, wet laboratories and faculty available for consultation. Members of the alliance include the ETSU Innovation Lab, Johnson City, TN; AB Tech Enka Small Business Incubator, Asheville, NC; NC Holston Business Development Center, Kingsport, TN; TN Pioneer Centers for Business Opportunity, Duffield and Norton, VA; VA Richlands Business Incubator, Richlands, VA; VA Highlands Small Business Incubator, Abingdon, VA demonstrating a true regional alliance effort.

Utilizing the incubator as a teaching tool

We previously reported on the use of technology-based incubators as a living laboratory for entrepreneurial students and provided a conceptual framework for utilizing the incubator in the educational process⁷. Students involved with these technology-based start-up businesses, either as an intern or employee, have the opportunity to observe how a new technology or innovation can become integrated into the marketplace or even become the new standard of the industry. This is a unique learning opportunity for technology and business students because in many cases the new technology does not have any direct competition, a situation that is different from many of the cases studies reviewed in typical business classes.

Many of our entrepreneurship classes are taught at the business incubator because of the availability of a “smart” classroom, telecommunication capabilities intentionally built into the facility to facilitate distance education and the proximity of “real life” entrepreneurs to the classroom itself. Many of the incubator clients are willing to participate in classes or panels to discuss how they decided to become entrepreneurs and share the hardships and experiences that they have had along the way. The mixture of textbook and real-life experiences provides our graduate entrepreneurship students with a stimulating environment for learning and an opportunity to explore alternative business models.

In addition to our own business incubator, we have the capability through the MountainSouth Incubator Alliance and other regional business incubators, to provide student teams with a semester long consulting opportunity working with startup technology-based entrepreneurial ventures. This course entitled “Strategic Experience” is a culminating experience project for students finishing their master degrees in technology or business administration. Students have the opportunity to consult on a variety of issues such as strategies related to business and

technology, competitor analysis, market niche identification, advertising, website design and many others. In business consulting situations such as these, student teams learn to expand beyond their current textbook and case study knowledge and extrapolate from information gleaned from other markets or from different experiential bases.

Opportunities for interaction

The opportunities for interaction between the university and the business incubator are unlimited. The presence of the business incubator can be a positive tool for the recruitment and maintenance of faculty that have a strong interest in research and the commercial development of their intellectual property. In addition, founders of technology-based businesses become valuable resources as guest lectures to business and technology courses bring real world experience to the classroom. Faculty members are sought after as consultants for projects at the incubators and university laboratories are leveraged as professors collaborate on joint research projects. Students gain experience working as employees of incubator companies having the chance to utilize laboratory and professional skills gained in the classroom and providing a life experience that is valuable as they seek employment after graduation. At ETSU several of the incubator companies are paying a portion of professor's salaries helping to decrease the budgetary burden on the university while maintaining or increasing the professional capabilities of the university.

Lessons learned and concluding statements

The decision to initiate the establishment of a university managed business incubator is one that should be carefully considered. Our experience at ETSU suggests the path to the successful launch of a business incubator is easier if the following steps are considered.

- Develop a shared vision for the business incubator through building consensus between administration, faculty, staff and students.
- Identify the potential risks that the university may face after the business incubator is operational. Benchmark with universities that have operational incubators and learn from their experience.
- Establish a university research foundation, if one is not already in place, to enable unencumbered management of the incubator, facilitate technology transfer and speed the process of grant administration.
- Obtain consensus regarding the level of self-sustainability that the incubator must reach once completed and operational.
- Develop a marketing strategy that promotes the capabilities of the incubator and enables the incubator to attract potential clients from the university, surrounding community or region.
- Develop alliances with other regional incubators as a mechanism to share operational experience, marketing concepts or niche development.
- Utilize incubator clients as guest lectures or members of panels to fully leverage the intellectual capital that resides in the incubator.
- Use the business incubator as a living laboratory for entrepreneurship and encourage students to learn from the resident companies either through internships, part-time employment or consulting projects.

- Develop mechanisms that favor the interaction between faculty and the business incubator.

These lessons described are the primary ones that we have experienced since the inception of our business incubator in 2002. The establishment of the Innovation Laboratory at ETSU has been a success to date and we expect continued success as our initial client company's graduate from the facility in the next few years. The authors and the ETSU Innovation Laboratory encourage and invite comments and questions regarding the topics included in this article.

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