Early Progress Indicators: an Innovation Incubator

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Abstract:

The goals of a novel Innovation Incubator (I\textsuperscript{2}) are to simultaneously enhance on-campus education and research as technology commercialization activities are deployed. The Incubator is beginning a third year of operations, and it is appropriate to look for early indicators of progress related to the effort. It is generally accepted that real evaluation of early and seed-stage investments cannot be completed for several years. However, qualitative assessments can be made on the impact of the Incubator.

One specific requirement of an I\textsuperscript{2} client is a commitment to enter a Small Business Innovative Research (SBIR) proposal during the course of the one-year of support. The baseline level of SBIR activity in Arkansas has been consistently poor in comparison to other states. The number of proposals made by Arkansas small businesses within the past two years have roughly tripled, resulting in a record number of Phase I successes. It is expected that these successes will be translated to increased level of Phase II successes. These accomplishments can be related to I\textsuperscript{2}.

A specific concern for Incubator personnel at the beginning of the program was the amount of deal flow. Within the past two years, seven spin-off companies have been formed, based around University IP – an increase from a base of virtually zero spin-off companies formed over the past 20 years. Increased activity is seen as a key early indication of progress relating to policy changes in the management of intellectual property by the University’s Sponsored Research office.

The incubator makes the case that progress has been made in a manner that is entirely complementary to ongoing education and research. The Incubator is fundamentally designed to have high student involvement. Research in many areas has increased in relevance as entrepreneurial faculty and students increasingly relate their research to application needs. The I\textsuperscript{2} applicant screening process is fundamentally linked with education goals, since graduate students participate at every stage. In addition, the majority of financial assistance that the Incubator provides to a small company is in the form of employment of graduate and undergraduate students to work on development of prototypes to meet the company’s needs.

In addition to other early indicators of success, two companies formed around graduate students that had completed a management course in Intra/Entrepreneurship of Technology have had recent success in obtaining SBIR and follow-on funding.

This paper is a continuation of the paper delivered at ASEE 2002 conference entitled “Launching an Innovation Incubator in a University Setting” by Vickers, Salamo, Loewer and Ahlen. In the 2004 conference, we will discuss early progress indicators and recommendations for broadening implementation.
Introduction

The National Science Foundation in February 2001 funded the University of Arkansas under the Partnership for Innovation program to initiate a new effort based on the “teaching through doing” paradigm. This program is a new concept targeted at providing a stimulative effect on very early stage technology-based company development. Importantly, the Incubator is designed to also produce desirable outcomes in University education and research initiatives. This matching of commercialization efforts to traditional university missions is expected to be one key to ensuring the longevity of the program.

The University of Arkansas operates a very successful incubator – the Genesis Technology Incubator. Genesis (http://genesis.uark.edu) is designed to provide operating space and business center support at minimum costs for technology companies in transition stages. Although Genesis has nurtured several successful small businesses, it does not nurture ideas. It does not bring together talent to explore, to inquire, and to innovate. The Innovation Incubator provides a new partnership to fill this innovation gap.

In its’ third year of operation, the Innovation Incubator implementation began in earnest in July 2001 with a new Director reporting for work. Policies and procedures were drafted and submitted for approval and statewide communications were initiated.

The goals of the Innovation Incubator are to:

- Promote growth of an entrepreneurial culture
- Increase rate of new company formation
- Assist small companies in obtaining early stage funding
- Enhance education, on-campus research and commercialization of technology
- Build assistance for technology startups into the university infrastructure

As the structure of the Incubator has evolved, a key objective being emphasized is that graduate students are intimately involved in all phases of the program, and learn from the interaction in several ways. In the past, a typical student graduating with a higher-level degree in science and engineering would have little or no exposure to business principles. The result has been a workforce entrant that has no preparation for many of tasks that they are expected to perform. By far the majority of such graduates will enter industry positions where they are involved in product development and support, as opposed to research and development. Understanding business objectives and how to work effectively as a team member are critical aspects of product development and support.

Creating a successful program requires integration of a number of factors. The critical raw ingredients are qualified personnel to staff the Incubator, individuals with good ideas, and access to financing, facilities and equipment in order to develop proof-of-concept. Once proof-of-concept is completed, other resources are available to assist our fledgling companies.
For details of the approach taken with $I^2$, reference may be made to the previous publication in ASEE 2002\(^1\). Essentially, individuals that approach $I^2$ receive a series of consultations. These interactions may lead to development of an Innovation Table, where the ideas are evaluated and augmented by a group of faculty, students and persons with business experience. A successful applicant may receive support in the form of a graduate student assigned to the company (student salary and tuition paid by $I^2$ for one year), and a voucher in the amount of a full $10,000 (no reduction for indirect costs) to be applied to supplies and materials, lab access fees, and other expenses that are determined to be key to development of the idea.

**Linkage to Education Mission**

Of course, maintaining connections to clients and resources is critically important to a successful program. Since the position is less than full time, the Director fulfills regular teaching assignments. The particular course that is being taught is Operations Seminar, which is a discussion class with the goal of providing students with exposure to subject matter that is typically not covered in science and engineering curriculum. This teaching assignment has fortuitously turned out to be highly beneficial to the mission of the Incubator. The class format results in the Director (instructor) developing a trusting relationship with a broad cross-section of graduate students, and enhances the quality of matching that takes place between entrepreneurs and students. This immersion in the graduate program is now recognized as an invaluable way for the Director to develop and nurture relationships with both students and faculty.

**Personnel**

Faculty are a critical component of not only the Incubator stages of development, but all of the later stages of commercialization. Faculty are the reservoir of knowledge and are often highly motivated to see their work result in benefits to broader society. There is a large diversity of interest in actually becoming involved in the day-to-day workings of a company. Some faculty members are excited to see their knowledge and skills being leveraged, but have no desire to become involved in commercialization. Others are willing to be involved in new company formation, but wish to maintain purely technical roles. A small but important minority of faculty members have the drive and desire to become entrepreneurs that initiate and grow small businesses. The goal of the Incubator is to engage faculty members at any level at which they are prepared to interact. In the current program there is no provision for additional compensation for faculty involvement. To date, sufficient faculty have been willing to prioritize their time away from other tasks. It is unknown at this time whether this commitment will be lasting.

Graduate students are involved with the Incubator in initial screening of clients, in working with clients to both improve intellectual property position and in developing initial business plans. Clients that have demonstrated an acceptable level of preparation are invited to make a formal presentation at the Innovation Table. The graduate student is once again involved at this point, and is included as a voting member of the committee that determines whether the prospective client will be accepted into the Incubator program.
Qualified and interested undergraduates are openly invited to participate in the Incubator program at all stages. Although there are few individual undergraduates that are prepared to dedicate the necessary time and energy to the Incubator program, those that participate are welcome additions to the program.

Once a client is accepted for full Incubator support, a single graduate student is assigned to each client for one year or more in order to perform on-campus research targeted at developing proof-of-concept for the client’s idea. Optionally, an undergraduate student may be paired with the graduate student and assigned to work 5 - 10 hours per week. As their work is completed, students can play an enormously constructive role by carrying out theses on subjects that can provide the data on which a small business can be launched.

During all of this interaction, graduate students gain experience in real-world commercialization situations, and simultaneously provide benefit to the area economy. One ultimate goal of the Innovation Incubator is to improve retention of graduates in the state or region. Over the long-term, improvement in retention can have dramatic consequences for the state and regional economies.

**Entrepreneurs**

A primary tenet of the Innovation Incubator is that the number of new business startups is not limited by availability of good ideas. Rather, the inability to overcome barriers that exist between people with good ideas and the necessary resources to obtain proof-of-concept is thought to be the limitation. A number of linkages have been formed at the outset in order to enhance the probability of reaching individuals that have good ideas.

Arkansas Science and Technology Authority (ASTA) is the organization that has the primary responsibility for identifying potential client relationships between the state’s industry and business and the Incubator. The Incubator objectives are supported by the ASTA staff, and the I^2 objectives are strongly aligned with the ASTA mission, with the president of ASTA (John Ahlen) serving as a Co-PI of the NSF grant to the Incubator program. ASTA staff identify potential businesses and development groups that might benefit from Incubator client status, facilitate initial discussions between the two groups, and act as an external monitoring agent to help judge the effectiveness of the relationship.

In addition to ASTA, the primary source of referrals to I^2 has been the faculty and students at UAF. Again, immersion of the Director in the graduate program has been highly beneficial to development of relationships to current and future entrepreneurs. In particular, the microelectronics-Photonics graduate program, with its’ required course in Intra/Entrepreneurship of Technology (MGMT 5383), has been effective in attracting students to become involved in startup company efforts.

Finally, partner Virtual Incubator Corporation, LLC (VIC) has presented several of its’ client companies as potential clients of I^2. This relationship has been highly beneficial, since VIC brings a balance of business and technical considerations to its’ client companies.
Access to financing

In the current environment in Arkansas, there is little opportunity for small companies to receive funding assistance from the state. Therefore, I² has directed its' clients towards federal funding opportunities in the form of SBIR/STTR grants. Application of several initiatives has resulted in a more than tripling of the number of both proposals and awards in 2003 relative to all past history. This effort is reinforced by a contractual obligation placed on I² client companies to make at least one SBIR/STTR application during the year of support.

In conjunction with the decision to focus on companies that have the ability to compete nationally for SBIR/STTR grants, the boundaries for I² client companies have been narrowed to include only those companies that include highly qualified principal investigators (PIs) in leadership roles.

University-Industry Relationships

As time has progressed, procedures have migrated from being somewhat formal to being relatively informal. This migration has been strongly encouraged by I², in line with a general desire to enhance the perception of the university as being accessible and open to small company involvement. As in all circumstances where dollars are involved, a well-written contract is vital to minimize disagreements and misunderstandings. However, beyond the initiation of a formal contract, I² has chosen to interact with company personnel with minimal conditions between the company and the university. The key to this relationship is to constantly recognize and promote the benefits that accrue to the university from the interaction.

In addition to the operations of the Incubator, partners in the enterprise have flourished. In particular, partner VIC has been very successful in negotiations with the university to license IP to startup companies. Whereas in all history prior to 2002 there had been only two spin-off companies from the University of Arkansas, a total of seven companies were spun-off in 2002-2003. Key to this success has been the development of more proactively interpreted policies at the university. Standardized agreements for intellectual property rights have been developed, making the university more predictable to small businesses, and reducing the time invested in reaching agreements. The key philosophy behind such agreements is that the University is willing to make modest investments in legal costs to protect IP, with the expectation that the successful commercialization of technology will result in return of these invested dollars with interest. In effect, the university is acting as an early seed stage investor in the spinoff companies. It is recognized that in addition to the potential to recoup investments with interest, there is fairly quick return to the university in terms of subcontracts, lab access fees, student employment and internships, and faculty involvement in increasingly relevant research. A simultaneous impact is that the on-campus patent committee is evaluating ideas more on their potential to bring positive benefits to society, with associated financial rewards, and less as simply a benefit to faculty.

Conflict-of-Interest

In the startup phase, it became apparent that the new Incubator was introducing ideas that were challenging to existing University practices. In general, it was found that while the official
University of Arkansas Board policy does not prohibit access by outside personnel, the policy tends to not be specific in some areas. The result is that implementation of the policy may be subject to interpretation. While commercialization is clearly favored in the current climate, new potential conflicts-of-interest are present, and policies and procedures must be continually reviewed and updated in order to provide clear guidelines. The approach of openly recognizing and documenting conflicts-of-interest, and of structuring appropriate oversight appears to be successful in mitigating concerns.

Deal flow

In 2001, it was obvious that there was insufficient deal flow for I². Within the state, there are at most four research centers that have significant potential to create startup knowledge-based businesses. It was decided to apply concentrated effort to the two locations, University of Arkansas Fayetteville (UAF) and University for Medical Sciences (UAMS) in Little Rock, in order to stimulate opportunities for business development. Each university is at the level of roughly $80M federal research dollars annually, and it is expected that there is a correlation between research dollar expenditures and innovations that may lead to new company formation. To date, efforts at the Fayetteville campus have been remarkably successful in providing the necessary stimulation, while there has been little connection to UAMS. Success has been attributed to the co-location of both the Director and partner VIC with the UAF campus. At this point, the distance barrier to UAMS appears to be difficult to surmount. Discussions are ongoing in an attempt to develop a management plan that will allow for increased collaboration between the two campuses and rapid progress in commercialization of innovations in the medical school.

Measurement and Evaluation

Assessment of outcomes for the Incubator is expected to require several years. However, program success must necessarily be judged on an annual basis. Therefore, some creativity is required in defining meaningful goals. At the time of this writing, this task is not complete.

Shorter-term progress indicators are the ability of our client companies to attract further funding. This involves both grant monies, angel and venture capital investments.

In addition, increase in the number of Genesis clients; number of new innovative products reaching the market due to Incubator partnership; establishment of an “innovation” culture with students and faculty; and demonstrations of the difference the university enterprise can have on the state economic well being are considered to be key outcomes. Measurement of education success has been included in the microElectronics-Photonics (microEP) graduate program. This program has designed and initiated a “before-and-after” evaluation of students. This includes Myers-Briggs measurements of Personality, Creativity, and attitudes of students. Additionally, placement of graduating students in industry is a key measurement. From the inception of the microEP graduate program in 1997, 100% of the graduating students have accepted jobs in related industry. An added measurement specific to the Incubator will be the number of graduates that accept positions within the regional community.
Current Status

The Innovation Incubator accepted its first client in early January 2002, and completed a match to a graduate student to support this client. This client is a startup company working in MEMS (micro-electro-mechanical systems) packaging. Since the patent rights belong to the University of Arkansas, it was necessary to develop agreements between the client and the University. In addition, this first client has won an NSF SBIR Phase I grant, and is preparing to compete for a Phase II grant.

A second client company, working on high-temperature electronics, was formed around an existing Genesis client company that was infused with new leadership. With this new leadership, the company has won two SBIR Phase I grants, one each from DoD and one from NSF. Again, Phase II opportunities are pending. Importantly, a DoD contract in the amount of $500,000 was recently inked, indicating that marketing efforts are beginning to broaden from the SBIR programs.

Both of these entrepreneurial startup companies are led by recent Ph.D. graduates of the microelectronics-Photonics interdisciplinary graduate program, and both have received instruction in the management course on Intra/Entrepreneurship of Technology.

Of nine other companies that have now been accepted to I^2, a total of 29 SBIR proposals have been entered, with 10 successes to date. Due to time lags between phases, most of the Phase II opportunities have not been addressed to date. Remarkably, these companies cover the range of applications from microelectronics to nanomaterials to alternatives to encryption methods. It appears that initial concerns with deal flow have largely been resolved. However, it should be mentioned that all of the initial success has been localized to the Fayetteville region, with little success in other locations within the state.

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References:

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