

## **Launching an Innovation Incubator in a University Setting**

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### **Abstract:**

A novel Innovation Incubator has been launched with the goal of enhancing both education and commercialization of technology. The Incubator supports area clients that have new ideas, but lack the resources to advance towards proof-of-concept. Graduate students are involved with the Incubator in screening clients, and working with clients to improve intellectual property position and develop initial business plans. Once a client is accepted for full Incubator support, a graduate student is assigned to the client for up to one year in order to perform on-campus research targeted at developing proof-of-concept for the client's idea. A voucher is included in order to provide for access to University facilities and equipment. Graduate students gain experience in real-world commercialization situations, and simultaneously provide benefit to the area economy.

This paper is a continuation of the paper delivered at ASEE 2001 conference entitled "University of Arkansas Innovation Incubator: Flaming the Sparks of Creativity" by Vickers, Salamo, Loewer and Ahlen<sup>1</sup>. In the 2002 conference, we will discuss early implementation details of the Innovation Incubator and considerations on clients in active consideration. In addition, we will discuss strategies for managing communications, successes and failures.

A number of policies and procedures have been developed in support of the launch of the Innovation Incubator. The "rules of engagement" have been developed, including the limitation on scope of activity both geographically and technologically. The applicant screening process is fundamentally linked with education goals, since graduate students participate at every stage. In addition, faculty members are involved in the critical decision-making processes. An objective scoring method has been created in order to insure that bias is minimized, and a committee drawing from a broad knowledge and experience base has been created. Clients are rated on five factors that intend to be predictive of success in commercialization.

A major activity of the Incubator is the matching of talents, desires and skills of graduate students with a client opportunity. Ideally, the work that the graduate student completes with a client will lead naturally to a Masters-level thesis.

In addition to being referred, the Incubator acts to refer clients to other resources. This necessitates that effort be applied continuously to renew linkages to other services and to share information on client needs. The larger community benefits from communication amongst the various service providers, since gaps and overlaps in services available can be identified. An overall communication strategy must exist in order to extend the reach of the Innovation Incubator to be statewide. Communication approaches will be discussed.

## **I. Introduction**

The National Science Foundation in fall 2000 funded the University of Arkansas under the Partnership for Innovation program to initiate a new effort based on the “teaching through doing” paradigm. This effort is intended to produce diverse graduates equipped with and ready to transfer new knowledge; to transfer scientific and technical know-how; and, most importantly, to transfer an innovative “can do” attitude into our general society. Undergraduates (juniors and seniors) and graduate students in chemistry, physics, engineering, biology, and business are the targeted students for this program. Small and developing technology based businesses in the state of Arkansas are the targeted customers of the improvement process.

Throughout the nation small businesses are responsible for our economic growth. One significant area for small business development is in science and technology. In this area, research universities have played a large role through its students and faculty in establishing start-up companies. For example, many universities have developed small business incubators. At the University of Arkansas this incubator is called “Genesis”. Genesis (<http://genesis.uark.edu>) is designed to provide operating space and business center support at minimum costs for technology companies in transition stages. Genesis also brings the universities’ intellectual resources to arms length for start-ups in the incubator. Indeed, it has nurtured several successful small businesses. What Genesis does not do is nurture ideas. It does not bring together talent to explore, to inquire, and to innovate.

This NSF PFI sponsored program will provide a new partnership to fill this innovation gap. A partnership that will nurture new ideas and provide the resources needed to demonstrate feasibility. And in doing so, this proposal will result in opportunities for University of Arkansas researchers to work with Arkansas industries, in an increased number of technology client companies in Genesis, in the establishment of an “innovation” culture with students and faculty, in identification of many valuable problems suitable for student research theses, and in multiple demonstrations of the difference the university enterprise can have on the economic well being of the state.

The Innovation Incubator implementation began in earnest in July 2001 with a new Director reporting for work. Two students were funded to start work in creating the infrastructure for the Innovation Incubator. Key personnel were in place to begin work. Policies and procedures were drafted and submitted for approval. Statewide communications were initiated.

The goals of the Innovation Incubator are to simultaneously enhance both education and commercialization of technology. 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.

Of course, connecting to clients and to resources is also critically important to a successful program.

## II. Implementation

### Personnel

The search for personnel to staff the Incubator was based on a template that has shown success over the past several years. While the search for a Director was nation-wide, the criteria for a candidate to have connections to the state of Arkansas was given extra weight. Experience has shown that individuals with ties or connections to the state will fit more readily into the environment and be more committed to the broader goals. Experience has also shown that there are many qualified candidates that have ties to Arkansas. Arkansas has excellent higher-level educational institutions, but in the past has had little industry to employ graduates from science and engineering programs. A large number of previous graduates have left the state to find employment simply because there were no local alternatives. There is often a latent desire to return to Arkansas, and this results in a recruiting opportunity. Individuals that are at a natural career and family breakpoint are particularly susceptible to the attraction of returning to Arkansas. A new Director fitting this profile was hired and began working on the Incubator in mid-July.

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 early stages of the program, there is no provision for additional compensation for faculty involvement. To date, 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 and working with clients to both improve intellectual property position and to develop 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 graduate student is assigned to the client for one year or more in order to perform on-campus research targeted at developing proof-of-concept for the client's idea. 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 formed.

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.

A key issue for startup technology companies is the lack of expertise and personnel to conduct market research and to complete business plans. The Incubator has teamed with Walton Business College's MBA program in order to link business students with technology company opportunities. Student teams that are formed strengthen the foundations of new business startups, and have the possibility of continuing involvement with the infant company as it takes the next steps towards commercialization.

In general, students that are well educated and trained in implementation skills are an invaluable component of the current efforts to impact small businesses in the state. Student's openness to new ideas, fresh-eyes perspective and enthusiasm can be channeled and brought to bear to create new possibilities.

### **Individuals with Good Ideas**

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. Although the Incubator has created a structure to address reduction of these barriers, a communication strategy is required in order to make potential candidates aware of the new opportunities. 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 will be supported by the ASTA staff. The Incubator 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 supplies significant resources to this Incubator program in both personnel and business contacts. The ASTA staff performs the majority of networking between Arkansas business interests and the on campus Incubator personnel. They 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. John Ahlen, in his role as Co-PI, has a seat on the Incubator Board of Directors, and actively participates in setting the policies that manage the Incubator to client relationships.

It is hoped that ASTA will be the agency that will provides continuing funding for Incubator operations at the end of the funding period. (Of course, this will be predicated on demonstration of the benefit of the Incubator to the state of Arkansas.)

In addition to industry, individuals with good ideas are the targeted customer of the Incubator. A strategy to contact individuals must also be launched. Overall, it has been found that the University of Arkansas is a ready source of people with good ideas. Several members of faculty, students and staff have an entrepreneurial spirit, would like to see their ideas tested in the marketplace, and are willing to work for little or no tangible compensation in the early business stages. This provides a strong basis for connections to individuals.

### **Access to resources**

The program offers clients a \$10,000 voucher that may be used to create prototypes or to prove concepts. This was initially defined as being a voucher for “on-campus services”. However, once we began dealing with real clients, a number of questions arose as to the boundaries for expenditures. Clients almost always need to purchase materials to support their work. Therefore, a portion of the budget should be allocated towards materials. It was decided that the actual amount should be reviewed on a case-by-case basis, and typically should not exceed 10 - 20% of the total voucher. A second question dealt with use of the funds for market research. After some discussion, it was again determined that this should be handled on a case-by-case basis and should not exceed 10 - 20% of the total voucher. In both cases, the expenditures are considered to be necessary at some level, but if these expenditures dominate the allocation of the voucher budget, then there is an expected reduction in the ability to complete important research steps. It was also decided that both a budget and a schedule for the expenditure of the voucher money should be created and agreed upon soon after signing a Client Agreement. Such budgets become a useful baseline to gauge progress during the course of the interaction.

One primary intention of the voucher, reinforced by the Client Agreement, is to provide access to on-campus facilities and equipment. This has been addressed by developing department charge-out rates for every department that participates in the Incubator program. The hourly charge-out rates reflect the average costs of operating the facility divided by total hours spent in the labs. When voucher money is paid to departments to compensate for access to labs, there is little actual increased cost to the labs. Voucher moneys paid can be viewed as a new source of revenue for the

labs, where there is little real increase in costs to offset the revenues. For this reason, the University can afford to support Incubator activities with very little increase in department budgets. On the other hand, departments may have discretionary authority over moneys collected from charge-outs, giving incentive at this level to increase such activities.

## **Boundaries**

A key initial step in launching the Incubator was determination of the program boundaries in seeking out individuals with good ideas. One portion of a Vision and Mission statement is a statement on “turf”, or the size and location of the playing field. In the case of the Incubator, there were two critical questions to be answered. What are the technological limitations and what are the geographic limits?

The initial plans for the Incubator were to limit client activities to Microelectronics and Photonics areas of technology, since these are areas of research strength at the University of Arkansas. During launch, a good deal of discussion ensued, and it was determined that this constraint might be limiting and prevent good ideas from being addressed. Refinement of the scope was guided by reference to the overall vision of creating high-quality jobs. There is a strong belief, well supported by benchmarking information from around the globe, that technology jobs are in fact high quality jobs. The primary intent of the Incubator is to focus on creation of jobs relating to high-tech manufactured products. This means, for instance, that software development is not a primary “fit” with the Incubator. Additionally, in response to lessons learned from knowledge-based economies, there is a strong bias towards situations where intellectual property exists and can be protected. Whoever controls the knowledge has a starting point for controlling the market. It was decided that the Incubator should strive to find resources to work with any client that has good prospects in creating high quality jobs.

The geographic limits were determined to be the state lines. While recognizing that these limits are somewhat arbitrary, some of the continuing funding support for the Incubator is derived from state taxpayer funds. Therefore, the situation demands that clients make a commitment towards commercialization within the state as a means to insure a return on the investment of taxpayer derived funds. The larger community makes both financial and emotional investments in a startup company or company expansion, and rightly evaluates these investments from a perspective of potential return-on-investment. It was determined that a company not based in Arkansas could be included as a client, but would be required to contractually commit to do follow-on development within the state of Arkansas. This leaves the door open to attract clients from adjacent or other states, and increases the overall competitiveness of the Incubator.

The present program budgeting allows for support of four client opportunities per year. It is expected that staff and faculty resource availability will limit the size of the program to serving about 6 – 10 clients. Beyond that, additional funding will be required for staff additions.

### **III. Complementary educational initiatives**

In the Microelectronics-Photonics graduate program, a pseudo-industry workgroup educational methodology is under the direction of Ken Vickers, who received engineering management experience from 1981 through 1998 in integrated circuit manufacturing with Texas Instruments. Students learn and apply standard factory control software and practices to monitor their own educational progress and marketability as well as the progress of all other students in the program. The success of the individual is judged not only by their personal educational accomplishments, but also by the success of all the students in the group. This methodology gives students a sense of connection as a team of people working on a common goal, and demonstrates the benefit of working in a coordinated group rather than as an individual among other individuals. We feel that this is the key training element that will multiply the effectiveness of all other training elements, as well as providing a natural opportunity for students to defend their ideas and share cultures.

Innovation courses are provided as a two semester special class at the senior undergraduate / first year graduate level, where students from science, engineering, and business work as a team. Business management techniques used to evaluate the feasibility of moving a concept from research to commercial production will be examined in the first semester. This will be followed in the second semester by the creation and characterization of a device and evaluation of its competitive position in the market. This will train the students to recognize the key difference between technology that can be made, versus technology that can be made profitably. The courses are team taught with business, science, and engineering faculty. The outcome of these courses will be a new generation of undergraduate and graduate students who have applied their knowledge, have worked successfully in teams, have developed their communication and presentation skills, and have participated in developing a small business.

### **IV. Policies and Procedures**

#### **Initial Meeting**

In preparation for launch of the Innovation Incubator, a structure needed to be created. A number of policies and procedures were created and reviewed by the Board of Directors prior to implementation. It was decided that an Initial Meeting would be defined, in which the Director and optionally other persons would meet with a prospective client.

This Initial Meeting is effectively a screening process, with a checklist of items to be discussed. At a minimum, these include discussion of intellectual property, confidentiality questions, and general fit of the client and the client's idea to the Incubator program. All barriers to open discussion must be removed prior to proceeding in order to maximize the probability of building a successful relationship. Most typically, it has been found that two or more meetings are required in order to resolve all issues.



Prior to holding the first meeting of the Innovation Table, a Non-Disclosure Agreement (NDA) is typically required. This protects all parties in the discussion. If the individual or company has already developed some intellectual property, then discussion with a diverse group of persons could be construed as public disclosure. Public disclosure is an important event with regards to filing for protection of intellectual property. By completing an NDA, then this issue is sidestepped and any discussion is not construed as being public disclosure. On a more practical side, disclosure of intellectual property to knowledgeable persons can often give opportunity for copy or improvement. The NDA is an easy way to document that the discussion occurred, and what information was transmitted. In either case, the NDA is an important way to control the legal status of intellectual property.

In addition to the NDA, there may be a requirement for a further agreement on intellectual property. In the case where principals in the client company are also University employees, then the standard University policy is that the intellectual property belongs exclusively to the University. (According to normal procedure, an invention disclosure would have been filed with the University soon after the invention was first conceived.) There are several items involved in agreements, including licensing, royalties, and equity stakes in a new company. All of these agreements should be completed prior to calling a meeting of the Innovation Table.

Following the Initial Meeting may be a number of meetings that involve work towards converging on the goals of the Incubator. Once a client has been determined informally to meet a set of preconditions, a formal letter of invitation to an Innovation Table is issued.

## **Innovation Table**

The Innovation Table is a real workbench on which students and potential small business individuals breadboard evolving ideas to establish feasibility. It is the table where students from different fields work side-by-side, and around which ideas flow freely, as a team effort produces the needed proof-of-principle. Equipment within the appropriate departments that could breadboard an idea under consideration is brought to this table. Such a table has been initially focused on physics and electrical engineering to take advantage of the resources available. The Incubator is prepared to expand into other engineering and science areas as clients express needs and matches to equipment and facilities can be made. These collaborative projects enrich both the larger community and our own educational mission by integrating students' research, creative work, classroom learning, and practical projects. They also promote collaboration among different generations of students, teachers, and community partners. The Innovation Table offers a new model of collaborative teaching and learning inside and outside the traditional boundaries of the university.

The Innovation Table includes membership from faculty, students, ASTA, and staff. A broad knowledge and experience base is assembled, including both academics and persons with background in industry. At the Innovation Table, full disclosure of the idea is made, along with

In practice, scheduling of the Innovation Table is never easy. Both faculty and students have defined schedules that must be considered. In addition, some participants at the Innovation Table will be required to travel some distance. Therefore, scheduling is an important task requiring management attention.

Scoring Summary			
		Total Score	152
		Total Score (percent)	63%
		Total Possible	240
Five Factor Scores	Research & Education Strategy Fit (40 possible)	31.3	
	Probability of Commercial Success (70 possible)	38.2	→ 45% Commercial Risk
	Probability of Technical Success (50 possible)	33.2	→ 34% Technical Risk
	Strategic Leverage (40 possible)	27.3	64% Total Risk (Commercial X Technical)
	Reward (40 possible)	21.6	
Risk vs Reward	Total Risk ( 3500 possible)	1268	
	Impact (10 possible)	7	
	Research Congruence (10 possible)	7	
Strategy Congruence	Education Congruence (10 possible)	10	
	Impact (10 possible)	7	
Goals:	Generally, a minimum Total score of 50% is desirable, although qualitative factors and context may be weighed. In the case where a project is accepted with a Total score of less than 50%, the additional factors applied should be documented.		

A sample “Scoring Summary” sheet is shown in Figure 1.

In addition to quantitative scoring, participants are encouraged to add comments that may be helpful to the client in understanding their rating.

A meeting of the Innovation Table participants is reconvened in order to share the ratings with the client. Regardless of the decision on whether to proceed with a client, the intention is that learning and growth should occur to the maximum extent possible. It is expected that a client that is rejected initially may further evolve their idea or business knowledge, and resubmit to the Incubator at a later date.

Once a client is accepted, a formal agreement between the client and the University is executed. This agreement specifies the commitments of the University and the individual or company, as well as the limits of the relationship. In a typical client agreement, planned work is to be completed by the assigned student, and the personnel involved with the company do not perform hands-on work. This has the benefit of maximizing the educational opportunities for the student. Additionally, this approach results in simplification of some of the legal liabilities to the institution. Since a graduate student is normally an employee of the University, then all policies and procedures of the University apply without revision.

Some items that were not considered in the initial approach became apparent once a client agreement was drafted. For example, implications for taxes, utility and material usage had not been considered. Once such issues were highlighted, it was relatively easy to address them in the client agreement.

## **Matching**

An accepted client opportunity must now be matched with a graduate student. The large number of simultaneous constraints make this a non-trivial task. A graduate student having the talent, educational background and desire to work on the project is of utmost importance. Once an interested and qualified graduate student is identified, then it must be determined that the work done for the client has the opportunity to lead to an M.S. level thesis.

In a two-year M.S. degree program, most second-year students are already committed to a thesis study area. Therefore, a first-year student is more likely to be available to start work with the Incubator. However, typically an M.S. graduate student will concentrate on coursework during the first year, and on a thesis project during the second year. Also, knowledge gained from the first-year coursework and familiarity with facilities, equipment and laboratory procedures may be important to the success in research areas. Contrary to this normal flow, a first-year graduate student that commits to work with an Innovation Incubator client may be required to begin work soon after arriving at the University. Since the standard commitment between the Incubator and a Client is for 12 months, then effectively the research work is front-loaded for the student. This is a cultural change that carries with it both positive and negative consequences. An arriving student is

given challenging assignments immediately, and will complete the M.S. program with more total work experience. With the relative inexperience of the graduate student at the outset of the project, careful management is required in order to insure that the client's work does not suffer.

As the program matures, it may well be that M.S. students will be able to complete two one-year client assignments, and to report on the second year work in order to complete their thesis requirement.

In the startup phase, it became apparent that the new Incubator was introducing ideas that were perceived by some to be threatening to the existing University structure. Many questions were dealt with relative to establishment of precedents for allowing clients to have access to University campus, facilities and staff. Of course, it is exactly such access that provides much of the advantage of the program. There is a good deal of ongoing discussion on how to best manage client access to be in line with the mission of the University. In general, it has been 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 such areas. The result is that conflict arises with operating guidelines that have been developed in implementation of the policy. These conflicts could largely be prevented by additions and clarifications to Board policy. While commercialization is clearly favored in the current climate, new potential conflicts-of-interest are present, and policies and procedures must be updated in order to provide clear guidelines.

## **V. Management**

The Incubator operates in every way as a small business. There are four areas that require management attention. These include daily operations management, task specific project management, task selection management, and policy management for the Incubator. Each of these four management functions must be accomplished in an efficient fashion for the Incubator to be successful in demonstrating value to the community.

Daily operations management involves primarily interaction with the client and the assigned graduate student. Graduate students are involved in coursework, and have varying demands on their time as the semester proceeds. It is important to work continuously to align the students and clients needs in order to maximize the effects of the program.

Specific project management has been addressed by application of Microsoft Project™ tools. At the outset of a client project, the graduate student is required to work with the client to develop a project plan. This plan is reviewed weekly with the Director or other staff of the Incubator to insure that work is progressing efficiently and effectively. As is typical of all project plans, frequent course corrections are required in order to take advantage of new knowledge or emerging situations. By maintaining weekly oversight, project slips or delays can be recognized and countered without jeopardizing the larger project goals. Joint review of projects is encouraged such that the students involved in different client projects can learn how problems

develop and are resolved. These meetings aim for a pseudo-industry workgroup approach, which is an integral part of the education plan for Microelectronics-Photonics students.

Task selection management is an ongoing activity. New prospective clients may appear irregularly, and there are multiple steps in counseling the clients towards eventual approval as clients of the Incubator. As indicated above, intellectual property concerns must be addressed up-front, and can frequently consume a number of days or weeks. In addition, it has been found that a number of prospective clients may be relatively naive about business plans. The University environment is rich with opportunities to create teamwork on business plan development. The Walton College of Business, the SBDC (Small Business Development Center) and SCORE (Senior Corps of Retired Executives) have all contributed in some fashion to assisting prospective clients in business plan development. Oversight is maintained on the status of each prospective client to insure that every opportunity is taken to bias the client towards success. It is believed that all efforts expended will enhance the value of the client's company.

Board of Directors policy management is an ongoing activity. Although the basic policies have now been developed, new questions dealing with clients frequently come up. For example, it is expected that potential conflict-of-interest questions will arise and need to be addressed. Both staff and students involved with the program may develop a desire to become clients. Each situation will likely be unique, and require efforts to develop and communicate policy.

Each of the management functions requires Incubator partners and interested parties to interface together at different levels of activity. Ultimately, such interaction is deemed to be critical to the success of the Incubator. Ongoing financial support for the program is contingent upon the various partners recognizing the value generated. Regular involvement is the primary means in which these partners will gain feedback on the success of the program.

## **VI. Next Steps for commercialization**

A successful client will complete proof-of-concept steps at the end of one year of interaction. At this point, the Incubator acts to refer clients to other resources. Genesis is a College of Engineering supported technology business incubator that creates a synergistic business environment at low cost to foster economic development by incubating new enterprises. Following the proof-of-concept stage that develops around the Innovation Table, a new company is ready to move into the small business incubator. At the same time, Incubator business, engineering, and physics students and faculty may continue to work with the new small business on SBIR proposals and on technological problems that develop along the way. Clients are strongly encouraged to seek funding from the SBIR/STTR programs. In order to enhance the probability of having companies apply for federal funds, and the possibility of winning such funds, the Innovation Incubator has provided leadership towards improving local and regional organization to respond to SBIR/STTR solicitations. Specifically, a support group has been initiated in order to help area residents win these federal dollars.

## VII. Measurement and Evaluation

Measurement is considered to be a non-trivial aspect of the program. The ultimate goal of delivering a high number and quality of jobs and revenues is expected to require several years to be demonstrated. 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.

The plans to monitor and assess progress toward realizing the partnership goals and related innovation outcomes are listed below. The Incubator Director will partner with Professor Ronna Turner of the UA Office of Research, Measurement, and Evaluation in the College of Education and Health Professions to lead the evaluation. The mission of the evaluation will be to assess eight key components of the proposed program: (i) effectiveness of the partnership to nurture new ideas and provide the resources needed for proof-of-principle; (ii) increase in opportunities for university researchers to work with Arkansas small businesses and transfer new knowledge; (iii) increase in the number of start-ups in Genesis; (iv) number of new innovative products reaching the market due to Incubator partnership; (v) establishment of an “innovation” culture with students and faculty; (vi) identification of problems suitable for student research theses; (vii) improvement in student creativity and related soft-skills, and (viii) demonstrations of the difference the university enterprise can have on the state economic well being.

Assessment of the program effectiveness will focus on these eight features and will be based on quantitative objective measures and perceptual assessments by students, faculty, small businesses, and student employers. Some quantitative objective measures are easily assessed. For example, measuring the number of start-ups, new innovative products, student theses, and opportunities to transfer new knowledge, can be counted. However, it is more difficult to determine innovative culture, creativity and related skills, nurturing of new ideas, and impact on the economic well being of the state. Here is where we must rely on perceptual assessment.

For example, perceptual assessment by employers of students graduating from the proposed program and the more traditional programs will be tracked over time for surveying perceptions of student creativity and overall success. After six months managers will be surveyed regarding their perceptions of early career effectiveness of the students they hired. These evaluations will include characteristics such as job performance, creativity, interpersonal skills, team building effectiveness, and leadership skills. Follow-up questionnaires will continue to be administered to employers at yearly intervals for five years. The longitudinal tracking of student performance is intended to provide a measure of long-term success and career advancement. Program graduates will also be surveyed on the same schedule regarding their perceptions of their academic preparation for the current job in which they are employed. Survey instruments are scheduled for development and piloting in the first year. A similar survey of students, faculty, and small business clients will assess innovative culture and the nurturing of new ideas while a survey of

state and university officials will assess impact on the state.

Measurement and evaluation is an inherent part of the overall implementation plan. However, the ultimate measurement of the program is the degree of success in both education and commercialization of the client's idea.

Measurement of education success has been included in the MicroElectronics-Photonics 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 Microelectronics-Photonics 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.

### **VIII. Connecting to clients and service providers**

#### **Communications**

Communications are a critical component of a successful program. With goals for statewide impact, it is especially important that communications are not limited to city or region. As mentioned earlier, alignment with ASTA creates an opportunity to use their well-developed network for identification of clients. To supplement this, a partnership has been nurtured with the Arkansas Democrat Gazette, which enjoys statewide circulation. In the evolving process, the attitude is reinforced that the assigned reporter will "go in with the troops". Key events are scheduled such that reporters can be on hand. It has been found that due to the highly technical nature of many of the Incubator interactions, there is a need to elevate the level of understanding of news reporters by spending extra time with them going over background information. Assigned reporters have been found to be eager to learn, and have responded favorably to spending more time in preparation.

Flyers or brochures have been created and distributed. While flyers are good for transmitting information, there is no substitute for face-to-face communications. Therefore, a good deal of travel is planned. To date, this has involved travel to tour industry within the state, and to visit with other campuses to explain our program. As communications reach more individuals across the state, it is expected that travel will be necessary in order to evaluate these client opportunities.

Yet another important aspect of communications is between clients and their potential customers. The Incubator must be prepared to stimulate customer interactions by creating formats for interaction. Clients refine their business plans each time they present their case to potential customers. Since ultimately customers will be the key to business success, and in turn to the success of the Incubator, such communications carry a high priority.

Besides the client side of communications, it is important to be able to recruit graduate students to participate in the Incubator. To date, The Director of the Incubator has maintained close ties with the Microelectronics-Photonics graduate program, and has been able to attract students through this connection.

## **Referrals**

An important part of overall program success is the ability to connect clients to as many resources as possible. Important client needs such as developing a business plan, conducting market research, and obtaining financing can be addressed by linking to the local or state resources mentioned above. With the detailed screening process being applied by the Incubator, it is expected that clients will be readily accepted by other agencies for assistance. However, careful communication and reinforcement of linkage is important at every step.

## **IX. 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 in general, and specifically on packaging for Optical components. The work is protected by a Provisional Patent, which was filed prior to the client being accepted for the Incubator. Since the patent rights belong to the University of Arkansas, there is ongoing discussion towards completing a licensing agreement between the client and the University. A significant part of this negotiation involves equity sharing between the company and the University. There is opportunity for both the University and the company to win in such an agreement. This first client scored well on the five factors, with an overall score of 63%. However, the score was also high on risk factors, with a Risk Score of 86%. This score indicates that the road to commercialization will be long and difficult.

A second client has been formally invited to present at the Innovation Table. This prospective client has plans to commercialize a technology that has been patented by the University. While a business plan has been completed, the prospective client is presently attempting to negotiate a licensing agreement with the University in order to have clear access to the pertinent technology. The Incubator is recommending that the licensing agreement be completed prior to taking the next steps. It has been found that licensing agreements are time-consuming, often requiring several months to complete. A NDA has been initiated in order to allow for open discussion at the Innovation Table.

A third client has been formally invited to present to the Innovation Table. At the time of this writing, this client is completing a NDA with the University. The relevant intellectual property is



not University-owned, but the principals in the company are University employees. A carefully written agreement is again required for this situation.

Two interactions involving students have emerged recently. In one case, a science student has an idea that appears to be sound, but has no business partners to assist in development of a company. In the other case, a business student has an idea, but has no relationship with engineering partners to test and develop the idea. These situations are examples where no means to bridge the gaps have existed in the past.

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### **Support:**

This material is based upon work supported by the National Science Foundation under Grant No. 0090596.

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Otto Loewer has been the Dean of the College of Engineering at the University of Arkansas since 1996, with eleven years of prior experience as a departmental chair at the University of Arkansas and the University of Florida. Dr. Loewer received a BS degree in Agricultural Engineering from Louisiana State University in 1968, an MS degree in Agricultural Engineering from Louisiana State University in 1970, and his Ph.D. in Agricultural Engineering from Purdue University in 1973. He also completed a MS degree in Agricultural Economics from Michigan State University in 1980.

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John Ahlen has been president of the Arkansas Science and Technology Authority since 1984, after serving eleven years in science advisory rolls on the Illinois Legislative Council. Dr. Ahlen spent twelve months in 1997-1998 as an ASME State-Federal Technology Fellow to the White House Office of Science and Technology Policy. Dr. Ahlen received a BS degree Bioengineering from University of Chicago at Chicago Circle in 1969 and his Ph.D. in Physiology/Bioengineering from the University of Illinois at the Medical Center in 1974.