AC 2007-824: DEVELOPING AN ANGEL INVESTOR FORUM TO COMPLEMENT AN ENGINEERING SCHOOL'S ENTREPRENEURSHIP INITIATIVES

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**Developing an Angel Investor Forum to Complement an
Engineering School's Entrepreneurship Initiatives**

Background

After two years of decline, entrepreneurial activity in the United States increased from 10.5 percent in 2002 to 11.9 percent in 2003. This level of activity ranks the U.S. 7th among 31 nations surveyed by the Global Entrepreneurship Monitor in Total Entrepreneurial Activity (TEA).¹ Importantly, the U.S. is the only nation among the G7 to register a TEA score in the top ten.

Today, nearly 50 percent of the growth in the U.S. economy can be attributed to entrepreneurial activity; much of this activity is in the technology sector. Since success in a technology venture requires both technical feasibility and economic viability an engineering curriculum that integrates both aspects is of considerable value.² Of the over 200 thousand graduates of college engineering and science programs each year in the U.S., a growing proportion seek employment in entrepreneurial ventures or are starting their own ventures. This trend among engineering and science graduates requires “a new type of engineer, an entrepreneurial engineer, who needs a broad range of skills and knowledge above and beyond a strong science and engineering background.”³ Companies around the world are actively seeking innovators who can solve business problems and assess risks, in addition to being technically proficient.⁴ It is no longer sufficient for engineers to perform in isolation, excluded from the decision making processes of the organizations in which they work. One technology company CEO stated, “If an engineer is not an entrepreneur, he is just a tool.”⁵

In recognition of the need to include entrepreneurial and other skills in the formal training of engineers, the Accreditation Board for Engineering and Technology (ABET) requires that engineering students have the following abilities:⁶

- Designing to meet desired needs
- Teamwork (particularly, multidisciplinary teamwork)
- Communication
- Problem solving
- Understanding engineering practice and its place in society

In addition to ABET, the American Society for Engineering Education (ASEE) has recommended a shift in engineering education that directly addresses the needs of a global economy.⁷

An increasing interest in entrepreneurship education in engineering schools has been met with enthusiasm from students, faculty, alumni, and administrators. Engineering schools are a natural locus for entrepreneurship education. Many of the technologies developed within the laboratories and offices of engineering faculty and students have ready applicability in a wide range of commercial settings. While not everyone who develops such technologies is interested in their commercial potential, much less interested in spearheading their migration to the marketplace, the value of an entrepreneurial mindset within engineering schools has intuitive appeal.

Entrepreneurship education in higher education in the United States actually began 40 years ago in technology centric programs. The Massachusetts Institute of Technology is often cited as the

birthplace of technology entrepreneurship education.⁸ MIT has continued its tradition of entrepreneurship since those early days, with technology and its commercial potential acknowledged and leveraged throughout the university.

Despite this early origin within technology-centric programs, entrepreneurship education in general has found a willing and accepting home within business schools. Literally thousands of business schools now offer entrepreneurship coursework, and many are home to full blown entrepreneurship centers or institutes. Most of these programs center on pedagogy and curriculum—they teach entrepreneurship to undergraduate and graduate business students.⁹ Most of these programs also are open to students from outside the business disciplines, but they are primarily populated by students from business.

In part this shift to a business-centric locus for entrepreneurship is due to the overlap between standard business curricula and topics within an entrepreneurship curriculum. This is notwithstanding the wide gulf between the philosophical core of most business school curricula—which is decidedly focused on large organizations and the challenges they face—and effective entrepreneurship curricula. For example, only recently have business schools developed graduate training leading to a PhD in entrepreneurship.¹⁰ This is likely the last stage in the maturing of the discipline before business schools develop full blown departments of entrepreneurship (as opposed the current “centers” or “institutes” that are common). Yet, it will take several decades for this to become the norm in business schools.

While entrepreneurship education continues to evolve and mature within business schools, questions linger about whether this is the proper locus for such programming. Many business school faculty and deans remain skeptical of the intellectual merits of entrepreneurship education.¹¹ For many, the content is little more than “business school light”. In other words, they see the entrepreneurship curriculum as a surface level summary of the more potent corporate focused and research based education offered in the “serious” departments of finance, marketing, accounting, and management. Often, professors within these disciplinary houses who either teach or conduct research within the entrepreneurship program are thought either to be moonlighting or simply losing their focus.

This paper contends that there are other factors that have influenced the business-centricity of entrepreneurship education on most American campuses. In addition to the overlap of curriculum between standard business education and entrepreneurship education, the business school also offers the path of least resistance from an evaluation perspective. Business schools do not have large research expenditures and investments in laboratories and equipment. They also don’t have large research expenditure requirements for faculty. Despite the ostensible business school focus on commercial success, most faculty have no interest in nor are they required to “pay their way”. They don’t have to be concerned with the commercial or grant winning potential of their research or of their intellectual activity. Business school faculty and PhD students are, in comparison to engineering school faculty and students and despite their location within the business school, largely immune from the pressures of commercial success.

With that immunity, the path of least resistance for entrepreneurship education is clearly the business school. The metrics of “success” for the entrepreneurship curriculum will be aligned

with the metrics of success of the business school. As the business school in general is not concerned with commercial impact or success, the entrepreneurship programs in business schools similarly lack this imperative. The business school curriculum is generally taught by individuals who have never served within the environments they teach about. That is, although purporting to teach about corporate finance or corporate management, most business school faculty have never actually worked within the corporate environment. Likewise, most entrepreneurship faculty members within the nation's business school have never been entrepreneurs (nor have most been practicing managers).

The metric of success for the corporate centric education within the business school is based on comparative exam performance. Students are evaluated relative to one another in their ability primarily to memorize course material. There is, usually, no further requirement actually to perform within the environment being studied.

This is not the case in engineering. Graduate, and increasingly undergraduate, students are required to demonstrate competence in the environments they are studying and within which they actually will be working. To be confirmed as a master or doctor in engineering requires competence in the laboratory—a real world setting. Most students who leave graduate programs in engineering enter environments that closely resemble the environments they experienced in their graduate programs.

For entrepreneurship education to maintain this level of match between education and “real world” within the engineering school environment requires more than is offered by the business school. By way of contrast, business school centric entrepreneurship education does not concern itself with actual commercial success of its graduates. It is enough that students perform well on exams based on the course content. They are not expected actually to become entrepreneurs during their tenure as students. This is consistent with the rest of the business school curriculum where students are expected to master the content, but, like their faculty mentors, they are not expected to actually perform within the setting they are studying.

For entrepreneurship education to sustain the same level of relevance within the engineering school environment as the primary engineering disciplines it will need to go beyond what is offered within the business school. In a word, entrepreneurship education within the engineering school must be more “realistic” than that offered within the business school. The term “realistic” will undoubtedly mean different things to different people. Still, there are a few elements of a reality oriented engineering entrepreneurship curriculum that seem non-controversial, including:

- An enhanced focus on intellectual property development and protection
- A focus on real technology development and commercialization (as opposed to mere business plan development offered by most business school based programs)
- Internships or practicum experiences that include placement within an entrepreneurial environment
- Basic knowledge of business principles that enable identification of knowledge gaps and how to fill them with relevant experts
- Extensive focus on early stage venture financing and fund raising

This paper will review efforts within the Ira A. Fulton School of Engineering at Arizona State University to develop relevant entrepreneurship programming within a school of engineering. At last year's ASEE program in Chicago, I presented a paper on a realistic curriculum, which is called "The Business Process Perspective". This year, I am going to describe a co-curricular enhancement called the Arizona Technology Investor Forum. This Forum brings like minded investors together to focus on technologies that have been developed within the laboratories of the Fulton School of Engineering. Students are involved in the Forum at several levels. They are encouraged to develop their technologies in a manner that allows them to take advantage of the possibility of presenting to the Forum. They are also engaged in evaluating the ventures for the Forum members from the perspective of investment potential. Finally, students are invited to Forum meetings to watch the entrepreneur presentations and listen to the feedback from the members.

The Arizona Technology Investor Forum

The Arizona Technology Investor Forum (ATIF) is an investment community of accredited private equity investors, venture capitalists, and corporate/institutional investors. Forum members invest in high-quality, diverse investment opportunities. ATIF deal flow originates in the laboratories and classrooms at Arizona State University. The investment community is managed out of ASU's Ira A. Fulton School of Engineering, Entrepreneurial Programs Office. Commercially viable technologies created at ASU are developed and transferred to the marketplace via Arizona Technology Enterprises (AzTE), the ASU technology transfer division.

The Valley region of Arizona is characterized by a number of lucrative investment opportunities in real estate and construction. Money flows freely to these types of opportunities in large part because there have been above average returns in these areas; and because many of the local investors are former real estate developers and brokers who know the industry particularly well.

While money flows well into real estate and construction deals in the Arizona Valley, technology start-ups have notoriously struggled to acquire seed funds that would promote their growth and development. In contrast, seed capital and other key support mechanisms are readily available to technology start-ups in the Bay Area of California, the Research Triangle Park area of North Carolina, and in other well known "technology corridors" in the U.S. and abroad.

ATIF was created to bridge the gap between technology start-ups and the nationwide angel capital community. As it matures, ATIF will play a critical role in the economic growth and development of Arizona, especially the Valley region.¹² Its mission is to generate a new wave of entrepreneurship by providing the necessary seed stage funding for worthy ventures. Limited to investments in the range of \$50,000 to \$500,000, ATIF provides the fuel for early stage ventures to achieve critical milestones and refine business models. The objective of ATIF is to provide equity or debt financing for intellectual property development and protection, prototype development, and initial marketing of a technology, product, process or invention.

ATIF was modeled on the nationwide investor community known as the Keiretsu Forum. The Keiretsu Forum is an investment community of accredited private equity investors, venture capitalists, and corporate/institutional investors. Forum members invest in high-quality, diverse

investment opportunities. The community is a North America network of capital, resources, and deal flow with chapters in Northern California (San Francisco, East Bay and Silicon Valley), Southern California (Westlake Village, Los Angeles, San Diego and Orange County), and Seattle/Northwest.

“Keiretsu” is a Japanese term describing a group of affiliated corporations with broad power and reach. The Keiretsu Forum is described as a conglomeration of individuals or small companies that are organized around private equity funding for mutual benefit. The Keiretsu Forum believes that through a holistic approach that includes interlocking relationships with partners and key resources it offers an association that produces quality deal-flow and investment opportunities to its members.

Similar to the Keiretsu Forum, ATIF membership is comprised of serious investors, business leaders, venture capitalists, corporate/institutional investors, and serial entrepreneurs. Membership is by invitation only. ATIF members enjoy synergies and close relationships with venture capital firms, Arizona State University, and investment banking institutions. These relationships facilitate the access to capital, talent, technology and resources needed to build successful ventures. A typical ATIF member is:

- An active private equity (angel) investor
- A trusted, honest and respected member of our business community,
- A contributor of time, wisdom and experience to our funded companies and soon to be funded companies,
- Someone who enjoys building relationships with other members and companies we fund.

ATIF deal flow comes from its community of members and, mainly, Arizona State University. ATIF members invest in opportunities that focus on emerging technologies: Life sciences/healthcare/biotech, nanotechnology, and other segments with high-growth opportunity. Membership in ATIF is extended to individuals who share its vision and will actively contribute to its process. ATIF members are accredited investors as that term is defined in Regulation D under the 1933 Act and under other applicable securities laws and regulations. ATIF member benefits include:

- Opportunity to screen high quality, diverse investment opportunities at quarterly deal screening and Forum meetings
- Expanded relationships built across industries that affect one another
- Collaborative business and social relationships
- Wide range of social activities that strengthen and build trusting relationships

In addition to the much-needed financing provided by ATIF members to ASU technology ventures, members also benefit from interacting with one another. Each event features several new technology venture presentations, as well as other presentations, including:

- Educational sessions on private equity investing, due diligence, and other topics
- Poster sessions from “junior” technologies that are not ready for funding
- Presentations from ASU alumni entrepreneurs on their latest ventures

- Networking opportunities during cocktail receptions and golf outings
- Due diligence presentations by ASU graduate students who have reviewed the venture

The ATIF membership experience is complemented by a web site that allows members to download documents and communicate with one another. The web site's protected member's only area not only stores documents pertinent to pending deals, but also serves as a repository for deals that have been vetted in previous ATIF meetings. ATIF members will be able to track and follow ventures as they mature. This enables them to make a financing decision when the timing is appropriate for them.

ATIF Membership

The Arizona Technology Investor Forum is a non-profit entity that is focused on introducing investors to seed or early-stage technology ventures. ATIF is managed by the Entrepreneurial Programs Office in the Ira A. Fulton School of Engineering at Arizona State University. ATIF is also affiliated with Arizona Technology Enterprises (AzTE), the technology-transfer arm of the university. This close relationship ensures a steady stream of student-, faculty-, and alumni-led technology ventures for ATIF member review and potential investment.

ATIF will be limited to 100 active members. Each member must be willing to invest a minimum of \$25,000 in ATIF-referred ventures within their two-year membership period. Membership in ATIF carries a tax-deductible annual fee of \$2,000. Each member will remain in good standing if the required minimum funding commitment is met.

As stated, ATIF is a community of serious technology investors. Member benefits include:

- Opportunities to acquire significant equity positions in early-stage, high growth potential technology ventures
- Quarterly meetings, featuring business plan presentations by ASU-affiliated technology ventures
- Opportunities to serve in advisory or board capacity on ATIF portfolio companies
- Regular dinner and speaker events arranged by ATIF for the purposes of networking and community building
- Opportunities to interact with like-minded investors who are involved in a variety of deals around the globe
- Opportunities to participate in events at ASU, including the Technology Entrepreneurship Challenge which is offered each year
- Interact with venture capitalists and angel investors from other regions of the United States, and around the world

ATIF began its membership recruiting via the advisory board that had previously been established for the Fulton School's entrepreneurial programs office (EPO). This board, consisting of approximately 15 active members, was asked to join ATIF and to recommend at least one additional member from their network of contacts and acquaintances. The initial ATIF meeting was held on September 29, 2006 with nearly 30 members attending. The goal of 100

members should be complete by the end of 2007. Funds raised through ATIF membership fees are used to pay for events, as well as a full-time program administrator.

ATIF Deal Flow

The Arizona Technology Investor Forum seeks deal flow from Arizona State University, with specific emphasis on deals emanating from the Ira A. Fulton School of Engineering. The initial preference is to work with the ASU technology transfer operation Arizona Technology Enterprises (AzTE) to identify and pre-qualify deals. AzTE assists faculty start up companies in moving technologies from the laboratory to commercial markets. A faculty start-up company is a company that is founded by an ASU employee based on ASU technology. The faculty start-up generally licenses its core technology from AzTE in exchange for royalties and other cash consideration, as well as equity in the company.

Given the early stage of many university technologies, creating a spin-out company to further technology development is often the most viable path to commercialization. It is an important part of AzTE's mission to assist ASU faculty in assessing whether a technology is ripe for a start-up company or whether some other commercialization strategy would be more beneficial. AzTE provides assistance to faculty entrepreneurs in many aspects of new company development including raising venture capital, hiring qualified senior management and providing general strategic guidance. AzTE works with faculty on all aspects of company formation including:

- Evaluating the company's business and marketing plan.
- Structuring transactions and preparing required documentation.
- Evaluating capitalization strategies.
- Evaluating management needs.
- Evaluating the strength of intellectual property.
- Managing the company's intellectual property portfolio.
- Determine whether forming the company will give rise to conflicts of interest.
- Assisting faculty to acquire all approvals necessary to form the company

If AzTE does not have technology ventures in the development pipeline that meet or exceed ATIF criteria, other sources of technology deals will be cultivated to ensure a steady flow of deals. The next priority for deal flow after AzTE ventures is ASU alumni who have developed technology ventures and remain in the Valley area. These ventures will be cultivated by the ATIF administrative team. To ensure a steady flow of such ventures, the alumni-entrepreneurs will be invited to ATIF meetings to present posters on their deals. If interest from members is strong based on the poster session, the alumni-entrepreneurs will be invited to present to the Forum during its regular meeting.

In addition to AzTE and ASU alumni, there are other sources of technology deal flow. The next priority for deals after ASU alumni will be given to ventures that are associated with ASU in some way. For example, ASU through various offices and venues provides support services to local entrepreneurs. The latter may not be associated with the university in any other way.

Nonetheless, as recipients of ASU aid and support for their entrepreneurial efforts, they are next in line for consideration to present at a regularly scheduled ATIF meeting.

Finally, if all these avenues have been exhausted and there remains a shortage of viable deals to present to the Forum, deal flow from the community will be sought without regard to affiliation to ASU. It is not anticipated that there will be a need for this last tier of deal flow.

Wherever the deals for ATIF come from, there will be general rules for evaluating their quality. The primary criteria for ATIF consideration include:

- Strong and experienced management team
- Patented or otherwise protected technology
- Substantial market opportunity with limited competition
- Proven business model
- Current cash flow and/or major client contracts preferred
- Fewer than 25 employees
- Private company with no prior venture capital funding
- Solid growth plan and proven history of milestone achievement
- Explicit use of funds proposal and funds management strategy
- Established governance structure and decision making procedures

Deal selection is done by the ATIF director in consultation with AzTE. The process of deal selection is conducted according to the following steps:

- Business plans, term sheets, and/or private placement memoranda are actively sought by ATIF staff
- ATIF staff screen all such documents to determine whether they meet minimal criteria for consideration
- ATIF staff distribute electronic copies of relevant documents to BOA members one week in advance of decision making
- By simple majority vote, the BOA determines which deals are eligible to move forward to the next stage in the process
- Deals with set terms that have been approved by the BOA are invited to present to the entire membership at ATIF monthly meetings
- For deals that do not have pre-existing terms, the BOA has the authority to negotiate and prepare term sheets on behalf of ATIF and its members
- Members are able to invest in ventures on a first come, first served basis

Figure 1 is a graphic representation of ATIF deal flow:

Figure 1

ATIF routinely surveys member interests to ensure a steady stream of deals that meet their investment objectives. Deals will be invited, thoroughly screened, and prepared for members to examine and make decisions. Primarily focused on technology ventures, deals will be invited from among the ASU faculty, alumni, and students first. Examples of some ventures that have been developed at ASU in the past year include:

- **AzERx:** AzERx is working towards the introduction of a drug called HSP20, a compound that promises to aid stroke victims by relaxing the smooth muscle tissue surrounding cerebral arteries. By relaxing this muscle tissue, HSP20 prevents vasospasms caused by blood entering the brain during a subarachnoid hemorrhage. AzERx also hopes to find other applications for the drug, including the relaxation of blood vessels during and after the clearing of clogged arteries, procedures involving vein grafts, as a possible treatment for asthma and for sexual dysfunction. In February 2006, OrthoLogic Corp. acquired AzERx. *AzERx was acquired by Arizona based Ulthera for \$7.7M in stock and cash in March 2006.*
- **USuggest:** USuggest, LLC is a pioneer software company commercializing its patent-pending social networking and user suggestion innovations to create the ultimate marketplace which can turn product and services suggestions between like-minded individuals into sales with unprecedented speed and effect. USuggest.com is the first buyer-oriented Internet shopping platform that can display shoppers' suggestions and reward shoppers for sharing and promoting the best deals they find on the net. *USuggest has received seed funding from angel investors in the amount of \$250,000.*

- **4Blox:** 4Blox, Inc. is an accelerator technology for Storage Area Networks (SAN's) that are based on the iSCSI (Internet Small Computer System Interface) protocol. The iSCSI protocol was ratified in 2003 and has begun to rival Fibre Channel in terms of overall storage performance at a much lower total cost of ownership. The iSCSI protocol is used as an envelope to transmit standard SCSI commands over any IP-based network. SAN storage is predominantly a block-storage architecture used in a wide variety of applications - including online transaction processing, database, email, IPTV, VOD and streaming environments. Given that standard Ethernet data rates are increasing faster than Fibre Channel (and similar disk-attachment technologies) iSCSI can address both the low-end and high-end markets with a single commodity-based solution. As "software-only", 4Blox is ideally positioned to accelerate iSCSI performance for a wide variety of storage hardware and software vendors.

Three early-stage ventures will present business plans at the February 16, 2007 ATIF meeting in Tempe. Each is based on ASU-generated technologies. The results of this event should be available to present to the ASEE meeting in June.

Student Involvement in ATIF

Student involvement in the Arizona Technology Investor Forum is an important part of the program. The program's primary intent is to help members gain access to promising early stage technology ventures with an ASU connection. This primary intent is supplemented by the motivational aspect the Forum offers to students and faculty developing technologies who now have a potential pathway to commercialization. Providing students with an environment that is not only pedagogically rich but that also contains financial resources requisite to success is a major contribution to engineering based entrepreneurship education.

ATIF deals are reviewed by ASU students involved in a separate program called the Technology Venture Clinic (TVC). The TVC is a joint venture between the School of Engineering, the College of Law, and the School of Business at ASU.

The Technology Venture Clinic (TVC) serves as a teaching laboratory but is run as a robust "market-focused" enterprise that leverages the intellectual capital of the ASU student body. Some of the university's brightest students, from several disciplines, including law, business, engineering and science, are recruited to work as members of this technology transfer team, gaining first hand knowledge of what works best in bringing new ideas to market. The students work in all aspects of technology venturing including patent investigation, business modeling, deal structuring, and market assessment and research. Twenty graduate students and undergraduate honor students are selected each semester to participate in a very competitive and sought-after opportunity to work within the TVC. Each member of the clinic receives class credit for participation, but equally as important, is integrated directly into the operations of a for-profit transaction venturing company.

In addition to reviewing deals and presenting their due-diligence findings to the group, ATIF also engages students from other entrepreneurship projects on the ASU campus. For example, ASU is fortunate to have been awarded an endowment to offer \$10 thousand to \$20 thousand seed funds each year to students, allowing them to pursue small ventures they've created. Called the "Edson Student Entrepreneur Initiative" (after its benefactor, Orin Edson), its student entrepreneurs are invited to present poster sessions that are reviewed by ATIF members prior to the formal meeting sessions. Students receive valuable feedback from these investors, and they may engage them as advisory board members.

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