AC 2009-1383: ATIC: A PROGRAM TO ENERGIZE UNIVERSITY-INDUSTRY COLLABORATIONS

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ATIC:
A Program to Energize University-Industry Collaborations

Abstract: Assessment of entrepreneurship courses/curricula/programs:

The Advanced Technology Innovation Center (ATIC) was established in the fall of 2006 at the ASU Polytechnic campus with its foremost mission of creating collaborations between industry, specifically small and medium enterprises (SMEs), and ASU faculty and students. Several barriers exist that stifle a close research and discovery based relationship between a university such as ASU and industry. Some of these are perceived while others are real. To highlight some: Any projects associated with ASU must have large dollar figures. At ASU we lack (with regards to SMEs) flexibility and rapid response capability. Projects incur large overhead which makes sense for federal projects but not for SMEs. Intellectual Property (IP) issues and the negotiation process are overwhelming for an SME and the faculty.

To overcome these barriers we developed the concept of ATIC with the following objectives as they relate to SMEs. ATIC is a vehicle that:

- Advances life-cycle applied interdisciplinary research: from conceptualization through development.
- Advances development of *economic affairs* by connecting small and medium size (technology) industries with ASU.
- Is small in "R", large in "D" and enormous in applied knowledge.
- Promotes the concept of technology embeddedness in the community.
- Taps into an underutilized knowledge capital (faculty and students) at ASU and is a revenue mechanism for ASU.
- Acts as a funnel for incoming technology requests from SMEs.
- Creates an umbrella or federation of participating labs with a **uniform front** and **back** end (contracts, IP, etc.).
- Networks and provides outreach in the SME community to raise awareness.
- Creates a **transdisciplinary** environment to encourage labs to participate/collaborate together in solving project problems.

ATIC emphasizes deliverables such as product development, prototyping, product focus group studies among other things. ATIC is an umbrella organization with links to faculty and facilities throughout ASU. In the short time that ATIC has been in existence we have executed thirty-five (35) industry related projects and landed the first SBIR/STTR in collaboration with a local company. ATIC's success has been both at the local and the national level. Through this paper we would like to describe the ideas behind establishing ATIC, the challenges of execution and share some of the early successes that the program has enjoyed.

1   Introduction

One of the major catalysts in technological advancements in the 20th century has been close working relationships between universities and industry both in the United States and Europe. There have been many successes including major hits such as drug discoveries, information technologies, new materials and efficient processes. Yet, the relationship between the two, in

general, remains full of tension, distrust and skepticism. There are adequate reasons and history to make the case for either side. However, neither can survive without the other if we are to maintain progress and solve the grand challenges of this century and beyond.

From a university's perspective the fundamental set of issues are:
1. Promote university-industry collaboration between its faculty (and students) and industry with projects funded by industry.
2. Do so in an environment of academic freedom, i.e. with as few constraints as possible on publishing, IP rights, technology transfer, etc.
3. Fit collaborations in the academic setting such as the calendar when faculty and students are available to work on projects or *Capstone* type projects which might be one or more semesters long.
4. The bottom line is that the projects must contribute to the educational mission of the university, rather than be seen as the university just providing inexpensive labor.
5. At the same time the university would like to increase the Return on Investment (ROI) it has made in its *knowledge capital* (faculty, students, labs, and other infrastructure). Universities, after all, need funds to operate and given the current financial crisis the need for external funds is even greater.

The above are only a subset of a long list of issues. For each point listed above, industrial collaborators respond with their own concerns and issues. David Wisler (WISLER[1]) points out in his paper the contrasting set of expectations in academic and industry. While all the criticisms one can make against such collaborations have been made, it is also true that university-industry collaborations have resulted in commercial successes. Google is one commonly cited example. Yet another angle of collaboration is when universities and industry collaborate to develop technologies for national defense. Here the government is usually the driving mechanism, mostly defining the goals and objectives and providing the funding.

ATIC at ASU is focusing its attention specifically on developing good partnerships between the university and industry. Through this paper we would like to describe the ideas behind establishing ATIC, the challenges of execution and share some of the early successes that the program has enjoyed.

2   Continuing Need for University-Industry Partnerships

It is well documented that hits like Google are few and far in between. University technology transfer offices around the country have filing cabinets full of patents that will never see any commercial development. To simply hang one's hat on a single success to define university-industry collaboration is simply a mistake. In fact, most universities are engaged with industry on a string of *small* projects, both in scope and funding involved.

Typically research revenues from collaborations with industry constitute a very small percentage of a university's total research revenue (government funding agencies contributing the lions share). At our university it hovers around 12%. This is even smaller for the subset of industry that makes up the Small Business Administration (SBA) definition of small-medium enterprises. This is an area where traditional effort has been lacking yet it has the potential of big pay off.

3 ATIC: A case study in works

Arizona State University is a Research I university. It is somewhat unique in that it has been developed as a set of many campuses spread over the Phoenix metro area. It has a traditional School of Engineering as well as a College of Technology and Innovation (CTI). CTI is housed on the Polytechnic campus, does not have a PhD program, and is focused on developing engineers (bachelors and terminal masters) for the work force. It is a relatively young campus and college with a mission that is still evolving. One of the strengths with respect to working with industry is the CTI faculty. Most faculty have spent at least three plus years in industry. Therefore, the network and connections are inherent. In addition they continue to consult and work with industry after becoming faculty. This naturally provides an environment to foster industry-university relationships.

The Advanced Technology Innovation Center (ATIC) was established in fall of 2006 at the ASU Polytechnic campus with its foremost mission of creating collaborations between industry, specifically small and medium enterprises (SMEs), and ASU faculty and students. Several barriers exist that stifle a close research and discovery based relationship between a university such as ASU and industry. Some of these are perceived while others are real. To highlight some: Any projects associated with ASU must have large[1] dollar figures. At ASU we lack (with regards to SMEs) flexibility and rapid response capability. Projects incur large overhead which makes sense for federal projects but not for SMEs. Intellectual Property (IP) issues and negotiation process is overwhelming for an SME and the faculty.

NCURA[2] report has developed a set of guiding principles for university-industry endeavors. We cite the basic tenets and guiding principles specified in the report for university-industry partnerships. ATIC has adopted these as well. The readers are referred to ETZKOW[3] and LOFSTE[4] for additional background on industry-university relationships.

1. Successful university-industry collaboration should support the mission of each partner. Any effort in conflict with the mission of either partner will ultimately fail.
2. Institutional practices and national resources should focus on fostering appropriate long-term partnerships between universities and industry.
3. Universities and industry should focus on maximizing value resulting from collaborations by streamlining negotiations and measuring results.

To overcome these barriers we developed the concept of ATIC with the following objectives as they relate to SMEs. ATIC is a vehicle that:

- Advances life-cycle applied interdisciplinary research: from conceptualization through development.
- Advances development of *economic affairs* by connecting small and medium size (technology) industries with ASU. ATIC takes small/medium companies and works with them to further enhance their product/design which then enables the company to further grow their business potential.
- Embraces small dollar value projects for SMEs. Current small projects range in value from a few hundred dollars to $20,000.
- Is small in "R", large in "D" and enormous in applied knowledge.

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[1] Large in this context means at least $100K, which for an SME is significant but would be considered *small* for a National Science Foundation grant for a project (as an example).

- Promotes the concept of technology embeddedness in the community. ATIC reaches out to the committee and promotes the capabilities available within ASU and offers an opportunity for the community to work jointly with ASU to achieve their goals with regards to research.
- Taps into an underutilized knowledge capital (faculty and students) at ASU and is a revenue mechanism for ASU.
- Acts as a funnel for incoming technology requests from SMEs.
- Creates an umbrella or federation of participating labs with a **uniform front** and **back** end (contracts, IP, etc.).
- Networks and provides outreach in the SME community to raise awareness.
- Creates a **transdisciplinary** environment to encourage labs to participate/collaborate together in solving project problems. ATIC currently collaborates with: Applied Software Engineering, Department of Engineering, Engineering Design, Mechanical and Manufacturing Engineering Technology, Partnership for Research in Spatial Modeling, Technology Ventures Services Group, to name a few.

3.1   ATIC Projects

ATIC emphasizes deliverables such as product development, prototyping, product focus group studies among other things. ATIC is an umbrella organization with links to faculty and facilities throughout ASU. In the short time that ATIC has been in existence we have executed thirty-five (35) industry related projects and landed the first SBIR/STTR in collaboration with a local company. We are currently engaged with eight SME's on potential projects and the average size of our current projects is $55K. ATIC's success has been both at the local and the national level. One way ATIC measures its success by the amount of inquiries that would otherwise have not been addressed and turn into ATIC projects. So far ATIC has logged 101 inquiries of which 33% have already turned into fully funded projects and an additional 9% are still in the initial inception phase. ATIC is open to projects of any size and duration and takes all inquiries seriously. There are times ATIC is not able to engage and there are a few reasons for that. One, either the expertise desired for a project idea does not exist at ASU or the idea is technically ill conceived or not fundable. An example of the former was in inquiry about manufacturing new kind of windshield for automobiles for snow conditions. Many inquiries assume that since we are a state university funded by the tax dollars, hence the *services,* i.e. time of faculty and students, is free.

3.2   Contacts and Follow-up

The contacts that are generated with business and individuals, up to this point in time, have been through news articles that have been written on ATIC, word of mouth and also university contacts. Our web site has been a wonderful asset in that individuals/companies can provide ATIC with all of the pertinent information via a contact form. The information is then received by the ATIC office and the process of evaluating the potential client's needs and finding the faculty match within ASU begins. ATIC then contacts the potential client with their findings and an initial meeting between the potential client and the interested faculty member is scheduled. If the match is made then the budget is prepared along with the ATIC Agreement and everything is provided to the potential client.

3.3 ATIC Projects and Program

Since ATIC began in December 2006 we have been able to handle 35 projects. Eight (8) of the 35 have been large dollar projects (over $100K), ten (10) have been small dollar projects (under $1K) and the remaining have been in the medium dollar range. We are having great success with clients returning for additional projects at larger dollar amounts. To date seventeen projects have been totally completed.

ATIC takes great pride in reaching the goal of a completion of a project. From the very first meeting with a client, ATIC prides itself on staying on task in order to meet the goals that were set with the client. Even before the project begins the scope of work is fine tuned and agreed to by both sides. Regular meetings are held with the research team and the client to discuss the project status, issues, obstacles, etc. We have found that staying in touch regularly with the client better enables the research groups to stay on top of any pending changes, etc. Since ATIC stays in close contact with our clients before, during and following project completion, we have been able to gauge the level of success and satisfaction that our clients have with working with ATIC, and we are pleased to say that our clients are very satisfied with the quality of work, competency of the research group, and the final product that they end up with whether it is an analysis, CAD drawing, or an actual prototype. We are also noticing that the students that work on our projects are coming back asking if we have more projects for them to be involved in. They are putting their skills to work and therefore it is a win/win situation for all involved. The students are learning and the clients are benefitting. Students are valued both for their technical skills and their entrepreneurial enthusiasm.

We present briefly a project conceived jointly between industry and ATIC and also a student entrepreneurship program that we have created.

3.3.1 3D Building Visualization for First Responders

The project is a joint collaboration between Kutta Technologies, Inc. and ASU. It is funded under the SBIR program of the Department of Homeland Security (DHS). Kutta Technologies, Inc. is a small enterprise located in the Phoenix metro area.

The focus of this project is to develop technology that will give first responders, such as firefighters and police, a 3D view inside buildings in order to effectively deal with major fires and other disasters. This technology will allow an incident commander (IC) at the scene of a major emergency to view the interior of the building in three dimensions on the screen of a laptop or handheld computer. This tool will also help ICs direct resources more efficiently and effectively, lowering the risk of loss and saving lives.
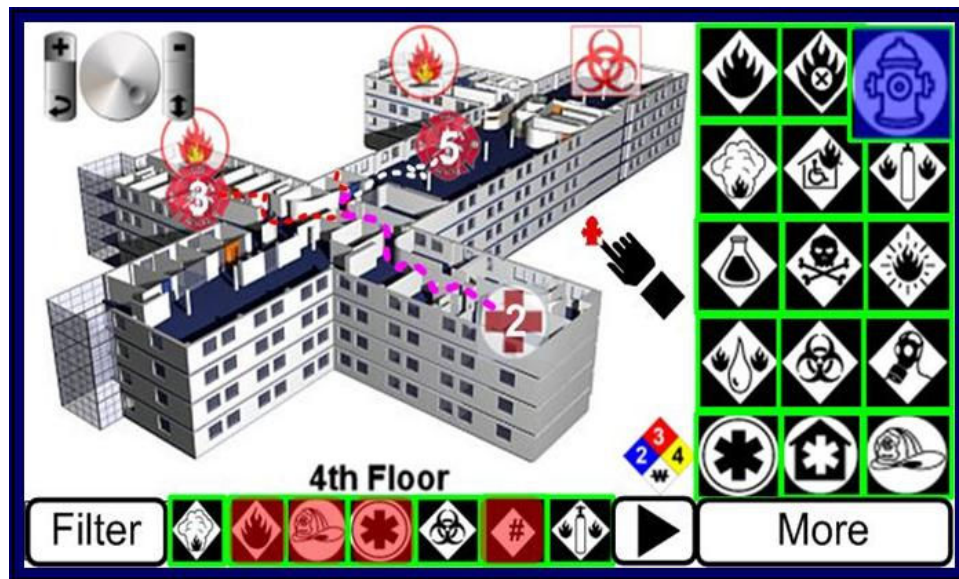
The tool provides personnel with the ability to annotate the incident scene by simply dragging and dropping standard DHS symbology (e.g. fire, smoke, bad guy) on a comprehensive display in a geo-referenced 2D and 3D environment. It comes with easy to use sketching options that allow an IC to edit the 3D structure in real-time (e.g. delete/add wall) and extrude a 3D model from scratch in a matter of seconds.

3.3.2 ATIC Student Success in Entrepreneurship Training (ASSET) Program

ATIC, along with the Career Preparation Center at ASU, has developed a program that focuses on the placement of qualified students in an industrial environment. The program, entitled ATIC Student Success in Entrepreneurship Training (ASSET), helps students connect with industry, promotes the pursuit of the student's entrepreneurial goals, and helps introduce industry to a greater portion of the talented student population on the Polytechnic campus. The ASSET program is advantageous to both students as well as participating companies.

Benefits for Companies/Businesses:
- Company/business gains bright, energetic students who can apply their latest education and skills.
- Confidence knowing intern selection is from a pool of highly qualified students.
- Interviews are scheduled and all hiring documentation and payroll management handled by ASSET.

Benefits for Students:
- Real world industry experience.
- Direct exposure to professional activity.
- Learning experiences that will enrich overall educational preparation.
- Practice in resume development and the interviewing process.
- Enhancement of personal and professional skills.
- Networking with businesses related to field of study.

Students in the ASSET candidate pool come from the undergraduate and graduate levels, and are from all engineering disciplines, computing studies, and other affiliated ASU academic programs. ASSET is an extremely helpful opportunity for students to receive direct exposure to real world professional activity which helps to better prepare them to enter their future professions, and increases the likelihood of them obtaining a position in their field of study. We have placed three (3) students successfully since ASSET's inception in June 2008.

4 Major Challenges and Lessons Learnt

ATIC is a young program but we have overcome many challenges and along the way some lessons have been learnt. We highlight some of these below.

4.1 Challenges

The first challenge ATIC faced was to convince ASU administration to support a new way of looking at the university-industry partnerships. This was considerable because we asked, at the same time, to lower the overhead rate that the university charges for SME projects. The second challenge was, and continues to be, to get industry to participate. The first meetings are dedicated to explaining the framework, setting realistic expectations, IP issues, costs and time frames. However, in our experience many companies come back for repeat projects once they have done one and also become our ambassadors to others in the community. Funding and IP rights are two of the major issues we continue to face. Industry likes to be billed for work completed whereas the university system and faculty are designed to receive funds upfront. ATIC has created a revolving fund that is able to advance funds to faculty to get the projects going and collect at the back end from the industry. Since ATIC works with many projects, we are able to spread the risk rather than letting an individual faculty take that on.

4.2 Lessons Learnt

Although each partnership and project has its own unique characteristic, we have found that most SME projects involve a basic set of challenges. Some of which are highlighted above. The cost of projects is an important one. Industrial partners do not understand the way a university prepares a research budget. The word *overhead* is an anathema to them and they consider that as a profit ASU is making on the project. Therefore, we have to be very careful in describing the accounting system used internally by ASU.

We have referred to this earlier but many companies come with a notion that they are providing an interesting project for the students or are even willing to pay some students salaries but cannot fathom why a portion of faculty time needs to be paid. Isn't faculty already being paid by my tax dollars? This is a familiar phrase to us.

IP rights are another issue. Although ASU has a technology transfer entity, directing the SME's to that part of ASU can lead to frustration and sometimes anger. Faculty and corresponding industry come together to do a project that requires trust and nurturing of the relationship between them. The technology transfer office, while doing its utmost to uphold the rights of the university, at times ends up engaging in long and protracted set of discussions with the industry partner. To counter this, we have developed some boiler plate contracts in conjunction with the university research administration office and the technology transfer office. Most SME's accept these as fair and it saves legal wrangling on both sides.

The single most important lesson is to provide a single *point of contact* at ASU for the industry. This job primarily falls on the ATIC program coordinator. At every step of the way, whether it is budgeting, accounts, IP, pre and post award, industry deals with the ATIC coordinator. This reduces finger pointing, creates accountability and shows ASU and ATIC commitment towards ensuring project success. The faculty also like that since it reduces the *bureaucratic* overhead on their part.

The logical question then is how does one scale this? As we expand, it is only logical to have more than one program and project managers whose full focus is to be a liaison between ASU and industry partners.

The funding model only works if the costs are realistic and small projects turn into big ones or university-industry projects become successful projects at the national level. Our 3D BVT project is funded under the SBIR program. We can only hope that projects like these also result in some commercial success and bring residual revenue back to ASU, the faculty and ATIC.

5   Acknowledgements

ATIC team would like to thank ASU and ASU Polytechnic administration for promoting and supporting the concept of ATIC. We would like to acknowledge the Office of Vice President for Research and Economic Affairs, Dean CTI, Entrepreneurship at ASU Initiative. In addition we would like to thank faculty, students and industry partners who participated in various projects and contributed to the success.

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