

2006-1798: A NON-CREDIT MODEL FOR REAL-LIFE TECHNOLOGY TRANSFER EXPERIENCE FOR CROSS-DISCIPLINARY STUDENT TEAMS

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A non-credit model for real-life technology transfer experience for cross-disciplinary student teams as a service to the Auburn University Office of Technology Transfer.

Abstract

This paper addresses several major issues of interest to ASEE's Entrepreneurship Division. It covers (1) university technology transfer; (2) introducing technology IP protocol management to students; and (3) a model of working relationship with university technology transfer officers for the mutual benefit of university technology transfer and the training of university graduates with real-life technology transfer problems. Student reported benefits are included.

Introduction

The Office of Technology Transfer of our university processes dozens of new inventions from the university laboratories each year. They need assistance in evaluating particularly engineering inventions for prompt processing and decision making. The following are some of the decisions the office needed to make on a routine basis although, the analysis needed was anything but routine:

1. Does the university have a significant patent position?
2. Does the commercial viability of the technology warrant incurring the cost and time of patenting?
3. How do we best protect the IP of the university and yet share relevant information with appropriate entities?
4. Is there a viable market?
5. How extensive is the market?
6. How best to define the market?
7. Who are the big players in the market?
8. Who might be interested in developing the new technology?
9. How do we get the message about the technology out there in simple terms?
10. What data should be acquired and from where to make these decisions?
11. How do we take lab scale results and make them appealing to industry?
12. How do we estimate the economics of a business founded on the invention?
13. How do we approach potential licensees and development partners?
14. How do we evaluate the technical viability in industrial setting?
15. Should we release the technology to the inventor?

The above is a partial list of questions or decisions needed to be made within a limited time frame to abide by patenting laws and university regulations. These decisions are made under conditions of risk; a bad decision could incur a cost to the university and/or may lose a potential transfer event and revenue stream. A good decision may bring in a transfer event that provides a useful product to the society and/or a much-needed revenue stream to the university. These decisions require the joint evaluation of much business and scientific/engineering data. The

analysis is time consuming and requires the gathering of considerable amount of relevant data from diverse, unspecified sources.

Since January 2004, a team of graduate students (full time MBA students) from the College of Business, and the College of Engineering, was assembled to work in teams under the supervision of the two authors. The effort was organized through a Center for Technology Management, whose director is one of the authors. Since January of 2004, As many as nine students worked in smaller teams of two or three evaluate new inventions given to the group by the Office of Technology Transfer. Each team faced real-life deadlines for completing their analysis and reporting.

A single team of two or three students (mixture of various engineering disciplines and MBA) may be assigned two or three inventions. Since progress on a single technology may be in stops and starts, two or three projects gave them a steady diet of work. Each week, the teams met with the two authors during two staff meetings, each lasting for about an hour. The meetings enabled students to report progress and receive input, clarification and directions for work. Additional meetings with inventors occurred on an as-needed basis.

Non-credit, Internship Model

We like to call this the Internship Model because students were paid as interns for an average of 10 hours per week to work in these Technology Transfer Teams (TTT). Financial support for the students came from the MBA program, the Samuel Ginn College of Engineering, or the Office of Technology Transfer for the first two years ending in December 2005. The students are recruited by one of the authors.

While offering this as a regularly scheduled course is an option, it cannot substitute for a real-life, internship model. In this model, the quality of the work must meet uniformly high standards set by the two authors. In a course for credit, the work of a student wishing not to strive for “A” and aims for “C” must be accepted. In the existing model, “A” quality work were accepted, and work was returned for rework when it did not meet the requisite quality level. The rework process ensured that students learned well and began to recognize better quality work. Quality of work is not an option. Student preparation for the job market could not be better.

A partial list of technologies evaluated or in the process of being evaluated:

1. Ruthenium Oxide supercapacitors
2. A process for economical carpet nylon recycling
3. Magnetic ring spinning technology
4. Reliability testing in IC circuits
5. Built-in testing (BIST) for IC circuits
6. A CVD process for depositing diamonds
7. A ferrous nanotechnology process for soil remediation
8. A process for estimating pore size in rocks and soil
9. Materials and methods for mitigation of soil liquefaction during earthquakes
10. Methods for nanoparticle processing with supercritical fluids

Background of students participating

This effort attracts students of diverse skills and training. Many have graduated and left the university, some had to stop working at the center to pursue graduate appointments with their major professors as part of their thesis or dissertation work, and some had to accept an internship with an outside firm. A total of 18 students have gained experience on these on projects so far; nine are still working here, nine have moved on. Current student backgrounds are:

1. One Ph.D. in paper technology pursuing an MBA degree
2. Three Ph.D. students in the college of engineering
3. One MBA enrolled in the master's degree program in industrial engineering.
4. One veterinary doctor pursuing MBA
5. Three masters students in engineering

The mix of students changes from semester to semester. Some semesters have had more MBA students than other semesters.

Outputs and accomplishments

Two graduates, who are placed in high-tech companies, credited their work in TTT for their landing the jobs and the offers they received. Some received internships with technology firms before graduation and credited the experience in TTT.

In the second year of the program, graduate students have volunteered to work on TTT projects without compensation. However, the current policy is not to engage any students who cannot be supported by us or the colleges of business or engineering.

So far, in over 18 months of work:

1. Number of technologies analyzed by student teams: 37 of which eight had prior patents
2. TTT-analyzed technologies that OTT decided to apply for non-provisional patents: 6
3. Potential licensees visited the campus for discussion with the inventors and to explore the technology for licensing: 7
4. Student attendances at conferences and industrial exhibitions: 3
5. Visits to business sites outside Auburn to make a presentation about an invention: 2.
6. Number of technologies still under active analysis: 14
7. Number of technologies on hold: 9—waiting for feedback from inventors.
8. Number of technologies in which the TTTs helped the authors reach final decision: 14
 - a. Two have been optioned (one company has signed an option to license, and a startup company based on these technologies is expected)
 - b. OTT decided not to pursue 12 inventions
 - i. Our analyses revealed that 3 did not have patent position—due to prior art, or previous public disclosure
 - ii. Nine were determined to lack commercial interest or value. Of these, seven were allowed to lapse while two were formally released back to the inventors

The process of investigating a technology involves numerous phone calls by the TTTs and the authors. Flyers were prepared on each technology that showed promise. These flyers were sent by e-mail to selected individuals in industry or government agencies. TTT analyses led to extensive discussion with major corporations by one or both authors. The discussions did not always lead to a license; the technologies are still under active analysis and commercialization.

What did the students learn and gained from the experience?

Their learning and experience will include but not limited to the following:

1. Cross-functional teamwork with students from a different college (business and engineering).
2. Knowledge of the patent process and learning how to search for prior art.
3. Knowledge of the process of evaluating new inventions for commercial value.
4. Writing skills explaining complex technologies to non-technical readers and decision makers in business.
5. Marketing the technology
6. Potential revenue and cost analysis
7. Assessing the intrinsic value of a technology
8. The art or working with a business professional or an engineering professional as the case may be.

The intangible education and training of students is evident in their confidence to tackle similar projects alone or in a team of business and engineering professionals.

An extension of the program

An extension of the program in the near future will be to offer free invention evaluation to the public¹. In this model, the public will be invited to submit requests for evaluation of their inventions in a specified application form. A few promising ones will be selected for evaluation. Student teams will be assigned the invention for evaluation. Teams would evaluate the prior art, technical feasibility, market size, potential licensees or development partners, and provide recommendations to the inventor on patentability, contacts for commercializing the product, and a business plan when appropriate. Expected benefits:

1. The program will train Auburn business and engineering students in a valuable area and prepare them for a career in invention evaluation, and entrepreneurship in due time.
2. The program will provide valuable service to inventors and budding entrepreneurs in the region.
3. The program could contribute to the economic development of the region over time.
4. The program could bring new businesses and investors to the newly-formed University Research Park and Incubator program managed by the Vice-President for Research, Auburn University.

How other universities may implement this model

The program is easy to transfer to other universities. It will require access to business and engineering graduate students and interested professors from the two colleges. A close working relationship with the university's Office of Technology Transfer is essential.

Funding the Internship model

The Internship Model requires one or more sources of funds to support the students and faculty supervisors of these projects. The benefits easily outweigh all costs associated with this model. At this university, there are multiple internal sponsors of the project. They cover the expenses of compensating graduate student time amounting to about 80 hours/week. The sources of funds are from the Office of Technology Transfer, the college of engineering dean and the MBA program.

Evaluating the benefits

This is a complex project that requires various means of evaluation. Following be considered as outcome:

1. The OTT applied for 6 non-provisional patents based on the recommendation from teams from this project. At roughly \$12,000 cost per patent, the student contributed to this \$72,000 decision.
2. Two technologies have been optioned to licensees who might start a new company to exploit the technologies. Future cash flow to the university is unknown at this time. These are long lead-time projects.
3. Many technologies have been put on hold based on student team input—not patented. Helps the university identify technologies that do not deserve the patenting expense.

Technologies take time to become commercially successful. Thus, to evaluate this project on the basis of positive cash flow to the university will take more time. Remember, the bread slicing machine (of the “greatest thing since sliced bread...” fame) took more than ten years to commercialize.

The interest of employers. One of the doctoral students nearing completion of his dissertation in materials science, who participated as a voluntary Intern at the Center, was recently interviewed for employment by one the renowned multi-national company known for its aggressive commercialization culture. The following quote is from the student:

“I recently had an interview with a major technology company. Although I did not include my Thomas Walter Center's (TWC) work as part of my presentation, almost every person I interviewed with (12 senior engineer/managers in all), noticed the entry in my resume and was curious to know my work with TWC. The following are some common questions I was asked:

1. *What does the Thomas Walter Center do?*
2. *Why did I have an interest in this work?*
3. *What projects did I work on? What were the results I achieved working on these projects.*
4. *Did my work involve recommending any patent decisions?*

The interviewers were interested in drawing parallels between TWC's technologies and their businesses. I mentioned to them projects I had worked on inventions related to nylon recycling, CVD diamond polishing and 3D carbon nanotube structures. They specifically wanted to know how my ideas helped developing new applications for existing technologies. They also wanted to know how successful the Center was in commercializing new technologies and the companies that we were targeting. While working for TWC, I had the opportunity to write a paper reviewing various commercialization practices followed by successful companies. This paper was also of considerable interest to the group."

Conclusion

Universities rarely offer a course or experience on technology transfer to business and engineering students in a joint forum.

In the current internship model, we can screen applicants. Students are held to a high standard for quality and timely completion of work—the standards are no less than what may prevail in industry. Students who perform poorly may be let go at the end of the semester or during the semester. Only one student was let go during the semester when he was overwhelmed by schoolwork and was unable to keep up with his team.

In summary, this “Internship” style model trains motivated students on technology transfer, cross-functional teamwork, and for success in industry. Industry has need for individuals trained in this manner but there is a shortage of individuals possessing the skills developed here. This is a successful model that has worked well for nearly two years without a break during the summer. We recommend this Auburn University model to other university colleges of business and engineering, and their OTT. Those interested in this model may visit, <http://www.eng.auburn.edu/center/twc/technologycommercialization.html>

As an extension of this successful model, the Thomas Walter Center has started offering this service to the public beginning early 2006. For more information, visit <http://www.eng.auburn.edu/center/twc/ICS/index.htm>

OTT's perspective: OTT has received very useful and in-depth feedback, analysis, and marketing recommendations on numerous technologies, significantly exceeding what the office could have done in-house. In the most successful example, a pair of technologies, that may have languished otherwise, are now the likely subject of a new company. This is, in part, due to the added breadth of technical and business expertise introduced by cross-functional teams.

References

1. Weick, C.W. 2003. A university-based model for evaluating inventions. *Entrepreneurship and Innovation*, Nov. 2003, 225-235.

End.