AC 2008-534: LEVERAGING A FLEXIBLE INTELLECTUAL PROPERTY POLICY TO BRING STUDENT INNOVATION TO MARKET

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Leveraging a Flexible Intellectual Property Policy to Bring Student Innovation to Market

Abstract

An engineering school at a primarily undergraduate, public, regional university in the Midwest uses a liberal intellectual property policy in conjunction with hands-on design and build projects in multiple classes to enable students to reap the rewards of their product ideas. The university's intellectual property policy contains two interesting facets that pertain to student innovation. First, students own their ideas. If a student proposes an idea to work on in a course then the student owns the resulting intellectual property as long as the student does not use more resources than the typical project in the class. The other interesting part of the policy is the concept of the innovation committee. The innovation committee, consisting of faculty and administrators, reviews intellectual property submitted by faculty and students. Faculty are required to submit their patentable ideas but for students it is optional. If the committee decides the idea has commercial potential, then the student negotiates a financial agreement to move the product forward through the patent process to market. The innovation committee usually offers money to obtain a patent, create a more refined prototype or help in licensing the technology. In return the student inventors agree to pay the committee a percentage of profits or give the committee part ownership in the resulting company. Examples of several student projects that used the assistance of the innovation committee will be described in the paper.

Background

Grand Valley State University (GVSU) is a public primarily-undergraduate regional comprehensive university serving over 26,000 students. The university was founded in 1960. Today the Mission of the school is “Educating students to shape their lives, their professions, and their societies. The university contributes to the enrichment of society through excellent teaching, active scholarship, and public service”. To fulfill the pubic service aspect of the mission statement, the School of Engineering (SOE) was established in 1980 to supply local industry with engineers capable of assuming leadership roles. Since it founding the SOE has been able to expand and build two buildings with the financial support of local industry. In the past decade, the forces of globalization and international competition have challenged manufacturing companies of all sizes that have traditionally supplied much of the economic vitality to the region.

At the same time the growth and maturation of GVSU required the formulation of a formal intellectual property policy. A committee of faculty and administrators established the policy 2004[1]. One of the guiding principles of the policy was the idea that the discoveries made at the university should pushed into the market to benefit the local economy. The salient points of the policy are summarized below.

1. The university may license or assign intellectual property to external entities for further development and commercialization in exchange for a return on resulting revenues. The university and creator (inventor) shall divide the return on resulting revenues using one of the two formulas as follows:

2. The University and the creator divide the gross revenue 70% to the university and 30% to the creator but the University assumes the expenses related to legal protection, marketing and commercialization and licensing and other transactional expenses related to the Intellectual property; or,

3. The university and the creator divide the net revenue 50% to the university and 50% to the creator but the university first recovers its expenses related to legal protection, marketing and commercialization and licensing and other transactional expenses related to the intellectual property.

4. If the university decides not to protect or license the intellectual property, or subsequently decides to not pursue commercialization of the Intellectual Property it may be reassigned to the creator(s), upon request. The return to the university for a reassignment of ownership will be ten percent (10%) of the net revenue generated by the intellectual property.

An "Innovation" committee was formed to advise the university about which intellectual property is worth protecting and licensing. The committee is made up of faculty and administrators. The committee is chaired by the executive director of the West Michigan Science & Technology Initiative (WMSTI), an organization dedicated to developing intellectual property from its member organizations in the region.

Student Involvement

The faculty supported the policy because they perceived the policy to be more generous than the policy of other research orientated universities in the area and geared toward the economic development of the local region. However the founding of the entrepreneurship minor and the product development major in engineering brought the question of student generated intellectual property to light. The entrepreneurship minor and the product development major were both initiated in 2004. Both programs encourage students to develop intellectual property as a part of the academic experience. Eventually, how to handle student generated intellectual property ended up as the topic of a meeting with the president of the university. The president, the Dean's of the business school and the engineering school, the faculty involved in the entrepreneurship minor and the product development major and the executive director of WMSTI were all in attendance. The issue of contention was does the university have a claim to some ownership of student intellectual property generated to fulfill course requirements. Widely divergent opinions and arguments were presented. The director of WMSTI argued that the university was entitled to part ownership of any intellectual property generated in the classroom or laboratory. The faculty countered that the students could not be treated like employees of the university. The students had paid for access to the faculty and laboratories as part of their tuition. The Deans did not express any opinions.

In the end the president brokered a compromise with the two unique points. First, students own their ideas. If a student proposes an idea to work on in a course then the student owns the resulting intellectual property as long as the student does not use more university resources than a typical project in the class. Second students may choose to present their ideas to the innovation committee to seek support to commercialize their ideas. When students seek such support from the innovation committee they are treated the same as faculty. This policy has lead students to propose more than half of all of the ideas submitted to the innovation committee.

Policy in Practice

As with most policies, the implementation details are as important as the statement of the policy. For the student intellectual property policy, the faculty teaching the courses that give rise to the intellectual property are key to the policies implementation. The faculty identify student projects with potential intellectual property and advise students of their options. In general students can do the following:

1. Try to commercialize their intellectual property on their own.
2. Apply to the innovation committee for support to commercialize their ideas.
3. Do nothing with their intellectual property.

Each option has different rewards and obstacles. The first option offers the highest financial rewards but has significant obstacles in terms of the student's ability to martial financial, time and business resources. This option also has the most risk associated with it. The third option has no rewards and no risk. Many engineering students are attracted second option because they can attempt to bring their product to market while minimizing their personal risk and time commitment. In addition the engineering students desire a patent with their name listed as inventors almost as much as financial rewards. Students desire patents for the

prestige of having a patent and as an aid to securing an attractive job offer. The risks of applying to the innovation committee include getting involved with a slow moving university bureaucracy, meeting the committee's demands for financial rewards and the possibility that university will take 10% of the net revenue generated even if the innovation committee rejects the idea. Weighing the risks and opportunities of the different options is an important learning experience for the students.

The students begin the process of applying to the innovation committee by filling out an Invention Disclosure Form (IDF). The IDF requires the student to describe the invention, the advantages of the invention compared to products available and the commercial applications of the invention. The IDF form is shown in the attached appendix. Some faculty require students to fill out the form as part of the required course work. Students then have the option of submitting the form. Other faculty require students to draft patent claims and include them in the form. The innovation committee rates each idea using on its financial viability, commercial viability, technical viability and the ideas alignment with the university's mission. The criteria and rating systems are shown in tables 1-4.

Financial Viability	Score			
	0	1	2	3
Cumulative Project Costs From Concept	Don't know	>$1M	<$500K	<$100K
Cumulative Sales Projection in First Five Years	Don't know	Sales >$1M	Sales >$5M	Sales >$10M
Margin Potential	Don't know	<20%	>50%	>90%
			TOTAL =	

Table 1. Criteria and rating system for judging the financial viability of an idea.

Commercial Viability	Score			
	0	1	2	3
Time to First Sales	Don't know	>5years	>2 years	0-2 years
Competition	Don't know	>3 Competitors	2-3 Competitors	No competitors
Market Size	Don't know	>$5M	>$10M	>$25M
Regulatory Requirements	Don't know	Significant Hurdles	Clear Path but Takes Time	None Required

Table 2. Criteria and rating system for judging the commercial viability of an idea.

Technical Viability	Score			
	0	1	2	3
Complexity	Don't know	Invention required (no known solution)	Innovation Required (modifications to existing solutions)	Incremental improvements or Off-the-shelf technology
Capability	Don't know	Not sure that anyone can do it	Must find or buy some key skills	Skills are available internally, or can be developed
Intellectual Property	Don't know	Patented prior art exists	Idea/Concept in Public Domain	Patentable; Provisional Filed Patent Filed /Issued
			TOTAL =	

Table 3. Criteria and rating system for judging the technical viability of an idea.

Univeraity Alignment	Score			
	0	1	2	3
Enhances Reputation	Don't know	Detracts	Neutral	Enhances
	Don't know			
	Don't know			
			TOTAL =	

Table 4. Criteria and rating system for judging how well an idea aligns with the mission of the university.

The students know these criteria and can use this information when they decide whether or not to apply to the innovation committee for support. The criteria are used as guidelines only. There are no minimum point requirements that an idea must achieve to receive support. The committee recommends which ideas to support and the head of the committee negotiates with the inventor and the university to reach a specific agreement.

Undergraduate Project Examples

The undergraduate engineering curriculum includes projects in multiple courses. The patent project work often occurs in one or more courses. In some cases the students that own the idea are not the ones who work on it in other courses.

The Trap Thrower Invention

The trap thrower invention was conceived by two students working on a design and build project for a junior level engineering class entitled “Manufacturing Control Systems”. One student was on GVSU’s rifle team.

He desired to have a trap thrower that could be programmed to throw a different number of traps in different patterns. In addition he thought that a setting for throwing a random number of traps in a random pattern would be useful. The students designed, built and financed the first prototype. The students then applied to the innovation committee for support. The committee believed that the concept was not only patentable but also technically, financially and commercially feasible. The committee recommended that a provisional patent be filed and that a second, more refined prototype be constructed to better demonstrate the benefits of the concept to companies that could potentially license the technology. The university agreed to finance the provisional patent and the construction of the second prototype. The students built the second prototype to fulfill the project requirement for a senior level course entitled "Advanced Product Design". The university is currently negotiating with a manufacturer to license the technology. Figure one shows a rendering of the product.

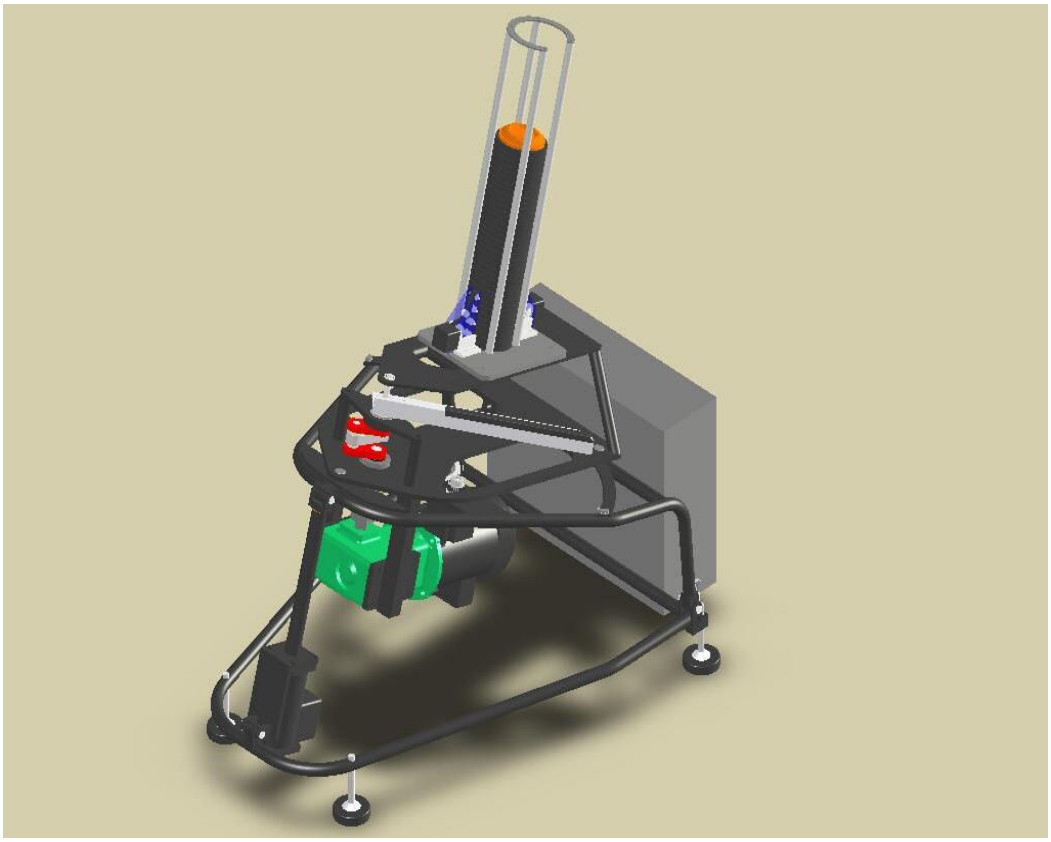

Figure 1. A rendering of the trap shooter product.

The Pedal-Pro Product

The need for the pedal-pro product was discovered in a graduate engineering design course. Unfortunately a marketable solution was not found. A student in the graduate class was a competitive bicyclist and he desired a product to measure, graph and analyze the torque produced by each leg as a function of the crank angle. Similar products on the market could not measure the torque produced by each leg separately. In addition many of the competitive products were designed for use on stationary bikes. A student in the advanced product design class decided to take up the challenge of creating a marketable product to meet the need. When the student's solution proved to be simple, low-cost and accurate, he applied to the innovation committee for help to bring the device to market. Unlike the trap thrower product, the student desired to form a company to manufacture and market the product. In this case the innovation committee decided to fund the provisional patent and use their contacts to help the student form the company and refine the design of the

product. The company, Magnum Engineering, has been formed and is now working to bring the product to market with the help of an undergraduate senior capstone project team. The product should be ready for market in the Fall of 2008.

Figure 2. Static testing of the torque sensing crank arm.

The Lean Wheel Chair

In the summer of 2007 the founder of MOVE International, a non-profit organization dedicated to helping special needs children achieve dignity, approached the engineering school in search of a device to transform a powered wheel chair into a training aid. She wanted a device that would allow a child to control the movement of a powered wheel chair by leaning. The act of leaning helps the children learn to control the muscles in their trunk. This is the first step in achieving mobility. In the fall of 2007 a team in the new product development class took on the challenge. The team worked with students and staff at a local school for special needs students to develop and refine a solution. The prototype was well received and the students were encouraged to think about the best way to bring their product to market. The team decided to finance the prototype without the help of the engineering school or MOVE international in order to preserve their claim to the resultant intellectual property. The team is now deciding if they want to apply to the innovation committee for support.

Graduate Project Example

During the fall of 2007 graduate students in EGR 604 - Implementation designed products with the intention of patenting the results using the universities system. From the outset the students were tasked with

identifying common problems, irritations, and issues. From these the class of 16 generated over 50 potential invention opportunities. These were narrowed down and concepts were generated for a smaller set. Students were asked to investigate the concepts to determine if similar products or patents existed. Eventually the class identified three areas without prior art that had market potential. Students were then tasked with producing working prototypes, preparing a patent application and an application for the university IP committee.

One of the three projects involved automotive speed bumps. Speed bumps are designed to manage traffic patterns by encouraging drivers to slow down and avoid jarring their cars. These are commonly made using a mound of paving material laid across a roadway. Although simple in concept they have a number of limitations. The use of paving materials requires special planning and labor to install and substantially more labor to remove. The performance is highly dependent on geometry, but this can be hard to control. Even slow drivers must endure the full motion of the bump, albeit at a slower pace. An alternate method for constructing speed bumps was devised that would use a non-Newtonian fluid housed inside a rubber bladder. The rubber bladder would stretch across the road, and normally hold the fluid in a mound shape. When deformed by a car tire there would be resistance to the deformation that is a function of the shear rate. In other words, driving slowly would result in a much lower force, and less lifting of the vehicle. Moreover, these speed bumps could be made in configurations that are portable and reusable. For example, for special events the bumps could be deployed in parking lots to slow cars. After the event the bumps can be collected and used elsewhere. Moreover the geometry and materials of the bumps could be varied so that they are tuned for higher/lower speeds and more or less tolerance for violations.

Discussion

The liberal intellectual property policy that is applied to student work has many advantages for the university as well as the students. The university advances its mission by commercializing products that will yield economic and social benefits to the local community. The School of Engineering is benefiting from engaged students who have confirmation of the worth and utility of the knowledge and skills they have gained through their education. Today many students aspire to graduate with a patent. Students gain experience with real-world design problems and the challenges of commercialization. For many students this is the first time they have considered becoming an entrepreneur. Although the intellectual property policy is young, initial results are encouraging.

References

1. Faculty Handbook, 2007-2008, [University] , [Location], 2007.

Appendix

GRAND VALLEY STATE UNIVERSITY

INVENTION DISCLOSURE

Cover Sheet for Inventors

An invention disclosure should be made when some new and useful idea has been conceived or developed at GVSU, or when a GVSU employee or student has obtained unusual, unexpected, or unobvious research results that can be utilized by someone to enhance economic development in west Michigan.

This Invention Disclosure Form ("IDF") will enable evaluation of your idea to determine (a) its patentability and (b) its potential for commercial value. An apparatus, a composition of matter, a method of doing something (including business methods), or any improvement in these things can be patentable.. An invention can also have commercial value, even if it is not patentable. The invention should be clearly described so that someone having knowledge in your particular field can understand its technical merits, its usefulness, and possible practical applications. Information that helps an evaluator appreciate the invention will increase its ultimate chances for successful patenting and possible commercialization. This is the goal in Section 1-4 of the attached IDF.

The remainder of the IDF covers certain general issues that need to be considered with every invention. The first is public disclosure of the invention (Section 5), because such disclosure places severe limitations on available patent protection. Non-confidential disclosure of an invention (to people outside of GVSU) may trigger a one year "grace" period within which a U.S. patent application may be filed. If an application is not filed within that time, U.S. law prevents you from ever obtaining patent protection for the disclosed invention. The patent laws of most other countries are even stricter: the right to patent protection is lost immediately upon public disclosure unless a patent application was filed prior to such disclosure. Thus, to secure the availability of worldwide patent protection, it is important that an IDF be submitted for timely review so that an evaluation can be done in order to timely file a patent application before public disclosure occurs.

Determining ownership and licensing rights in the invention is addressed in Section 6. Identification of the financial support used during the development of the invention helps determine whether contractual obligations exist with research sponsors or collaborators.

The final issue addressed by the IDF is the identification of the individuals who contributed to the development of the invention (Section 7). Please note that these individuals may not meet legal criteria for inventorship. Inventorship is determined/clarified by a patent counsel at the time a patent application is filed. Only the person completing the IDF and the Department Head need to date and sign this form.

Please use the backs of the IDF pages or appended sheets if space is insufficient. You are encouraged to include additional comments that you or the other contributors may have regarding the invention.

For advice on completing the disclosure form or for additional information, contact Linda Chamberlain at 331-5859 or chambeli@gvsu.edu.

GRAND VALLEY STATE UNIVERSITY

INVENTION DISCLOSURE

Date _____

A patentable invention may be any new and useful composition of matter, methods, including business methods, processes, software, designs, machines, articles of manufacture, or any new and useful improvement thereof.

1. TITLE OF THE INVENTION: (Brief, but comprehensive, technically accurate and descriptive.)

2. CONCISE DESCRIPTION OF THE INVENTION: Your disclosure should enable someone having knowledge of your field to understand the invention. Include all essential elements (features, concepts, or new results, whichever is most applicable), their relationship to one another, and their mode of operation. Identify the elements that you consider novel. Also, if the invention is an apparatus or system, attach drawings or sketches and indicate if it has ever been built or tested. Use additional pages, attach drawings, manuscripts, papers, or other supporting material to facilitate understanding of the invention.

3. USES/ USEFULNESS/ ADVANTAGES OF THE INVENTION OVER CURRENTLY AVAILABLE TECHNOLOGY: Describe what is presently available or known in the field. Identify existing compositions, devices or processes (and their shortcomings) and list any published material such as scientific articles, patents or commercial literature related to the invention. Identify advantages or benefits of the invention over currently available technology, such as efficiency, cost benefit, simplicity, overcoming a defect. Identify possible uses or new uses for the invention.

4. POTENTIAL COMMERCIAL APPLICATIONS OF THE INVENTION / POTENTIAL LICENSEES: What do you envision as commercial applications? (Feel free to be creative and speculative!) Have you been contacted by any party regarding the licensing of your invention? Are you aware of any companies in the field that may be interested in your invention? Are there current plans to use your idea commercially?

5. PUBLIC DISCLOSURE/ PUBLICATION PLANS: Has the invention been disclosed to anyone outside GVSU? A "public disclosure" or "publication" includes: abstracts and presentations at meetings (including poster session), public seminars, full-length papers, student theses (once shelved in a library), disclosure to any person outside of GVSU who has not signed a confidentiality agreement. Has there been any public use, sale, or offer of sale of the invention? Identify dates and circumstances of any such disclosures. Also, indicate your future disclosure or publication plans, and NOTIFY your Department Head if the invention becomes publicly disclosed or published in the future (whether deliberate or inadvertent).