

Addressing Intellectual Property (IP) and Student Needs in Industry Collaborative Student Projects

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Abstract: Many engineering programs are encouraging collaborative student projects with industry sponsors. These joint or sponsored projects can benefit both students and sponsors providing real world experience for the students and low cost research or development opportunities for the sponsor. However, both sides must enter into these arrangements with open eyes and realistic expectations. This paper will explore the balance of interests among (i) students' career advancement, (ii) non-disclosure obligations, (iii) intellectual property (IP) rights, and (iv) project funding.

Introduction: The Electrical and Computer Engineering and Technology department at Minnesota State University, Mankato has approximately 25 electrical and computer engineering students graduate each year. The department is fortunate to be supported by a very active Industrial Advisory Board (IAB). This board meets at least twice a year and has in the past been involved in reviewing student senior design projects. As a result of IAB member interest and involvement with local industry and inventors, the Fall 2009 and Spring 2010 senior design experiences were truly collaborative and real world experiences. The first project consisted of a rework of an existing commercially available product. The second design effort consisted of taking a concept that was undergoing patent protection and creating hardware to support demonstration of the proof of concept. Both experiences were incredibly positive for the students and sponsors but also provided challenges that others following this path should be aware of.

Design experience 1. The Fall 2009 senior design experience truly began during the summer of 2009 with the course instructor meeting with the president of the company with the product needing redesign. The product is a very successful commercial product in which the company is planning to move from a dated input method into something that is more user-friendly. Further, the project was to explore the possibility of adding additional data storage and analysis to provide the company with a recurring income stream. The project provided many lessons learned for course instructor, the project sponsor and also the students. These will be described in general terms because currently the project is still under a nondisclosure agreement.

Positives associated with this project:

- Students were able to visit the production location.
- Students were able to see current products and move a current product into the lab for redesign.
- Students were able to use the current product as a test-bed.
- Students had to work with existing portions of current product which forced them to work

with real-world constraints

Design Experience 1 Implementation: The students were divided into teams of three or four. Each team was assigned a portion of the project and in some cases teams had overlapping or parallel responsibilities. One of the challenges associated with this is that some teams had more of a hardware focus while others had more of a software focus. Efforts in senior design are always expended to make sure students have a balanced hardware and software experience as part of their final design experience. Because this design needed to be completed in one semester students chose to use many off-the-shelf components and became in many cases systems integrators.

Challenges that occurred with this project:

- The students have a limited ability to discuss the project with others because of nondisclosure agreements required by industry sponsor.
- Time dependency created significant challenges in a one credit class to complete this effort within 15 weeks.
- The end result really has become a proof of concept rather than something that can be easily manufactured.
- Students because of the very rapid need to get this done in many cases did not have as holistic experience as with other projects.
- Dependencies of one group on the deliverable of another group became a challenge. Timeline slipping for one group and their deliverables created significant of issues with others resulting in finger pointing.
- How does the sponsoring company move forward with lessons learned?

Design experience 2: The second design experience occurred as a result of the discussion with one of our IAB board members who was working with a firefighter seeking a patent for his invention. As a starting point the firefighter came and presented his system concept to the senior design course during the second class meeting in the Spring 2010 semester. During the remainder of the week the students in the class were required to submit brief project proposals of what they would like to do for their final semester project in the senior design course to the course instructor. Based on the information provided by our potential sponsor two groups decided to undertake designs to support his product development. In both cases these teams had three members and in both cases the teams elected to take portions of the project that covered both hardware and software concepts. The nondisclosure agreement (NDA) was prepared and provided students for their examination and acceptance. Students who elected to work on this project had to complete and abide by the nondisclosure agreement. This agreement was iterated upon multiple times to make sure that students had the ability to discuss the project with potential employers and yet the provisions of the agreement would protect the inventor from inappropriate disclosures. Key provision of a sample agreement can be found at the end of this paper.

Students working on this project provided regular updates to the project sponsor showing both successes and challenges. Expenses for this project unlike those for other senior design projects were covered by the inventor. The course instructor however discussed with students the need to be charging only for successes and not imposing the cost of learning on the inventor. Students

commenting on the differences in the both real world experiences pointed at the advantages of looking at a project in which they as a team were responsible for all aspects rather than depending upon other teams to meet other design requirements.

Issues to be resolved before design efforts start:

- All involved must have a clear understanding of the NDA and what it requires and what limitations it imposes. It is recommended that as we did, the author be available to discuss the implications of the NDA with students.
- It is critical when efforts like this occur in a one semester course that groundwork for this occur before the semester starts.
- The scope of each team's assignment and the required design interfaces between teams should be carefully matched to team size so that each team can produce a useful prototype independent of the progress of other teams.

Concluding thoughts:

The current course configuration for senior design at Minnesota State University Mankato provides students one course credit for each semester of effort in their senior design course. Most students are completing 15 credits of coursework during both semesters in their senior year. Additionally, most students are working part time to fund their education and in the Spring semester most students further increase their workload by seeking fulltime employment.

The positives associated with industry sponsorship are great! Comments from students working on the projects point to the positive experience of working on a project that really can make a difference. The students realized that their efforts supported increasing corporate viability of a small company with their first semester effort and developed the prototype for a new system in the second system effort that could be the basis or helping or protecting others. The students' efforts were further validated when the prototype from the second semester effort won the grand prize award at the 2010 Minnesota Inventors Congress.

Questions that still exist: What happens at the end of the semester – what should really happen? Students want/need to move on but small companies still need help moving forward. In the case of the second design system the Inventors Congress provided public exposure and opportunities for this inventor to continue moving forward. In the case of the other system the course instructor is still working with the company trying to find cost-effective engineering talent to move their product line forward.

Lessons learned:

- As has been found in the past, student teams of greater than three reduced the learning experience and were much harder to coordinate and grade.
- Student teams that depend upon others result in significant finger-pointing.
- Faculty engagement with industry sponsored projects significantly increases the faculty workload.
- Students engage and expend significantly more effort on projects with external sponsorship.
- Industry expectations must be clearly managed with it being clearly understood that the output of student projects is best viewed as proof of concept.

- Students in a senior design course are not well-equipped to create true manufacturing prototypes.
- Students need to have an understanding of intellectual property and appropriate documentation before entering into industry sponsored projects.
- Students' willingness to complete documentation with industry sponsored projects is better than with faculty directed and created projects.

Appendix A

Selected Provisions of a **Nondisclosure Agreement suitable for industry-student collaboration effort**

These provisions are between students or faculty members (“PARTICIPANT”) in an identified course during a specified semester and the industry sponsor (“SPONSOR”). The key provisions addresses issues relating to (1) proprietary information, (2) ownership of inventions, and (3) non-competition.

1. Proprietary Information

a. Restrictions on Proprietary Information

I agree that, during the COURSE and after, I will hold the Proprietary Information of the SPONSOR in strict confidence and will neither use the information nor disclose it to anyone, except to the extent necessary to carry out my responsibilities as a PARTICIPANT of the COURSE or as specifically authorized in writing by the SPONSOR.

I understand that "Proprietary Information" means all information pertaining in any manner to the business of the SPONSOR or its affiliates, consultants, or business associates, unless:

- i. the information is or becomes publicly known through lawful means;
- ii. the information was part of my general knowledge prior to the COURSE; or
- iii. the information is disclosed to me without restriction by a third party who rightfully possesses the information and did not learn of it from the SPONSOR.

This definition includes, but is not limited to, (A) schematics, techniques, development tools, processes, computer printouts, computer programs, design drawings and manuals, electronic codes, formulas and improvements; (B) information about costs, profits, markets, sales, customers, and bids; and (C) plans for business, marketing, future development and new product concepts.

b. Permitted Disclosures

SPONSOR authorizes limited disclosures of certain Proprietary Information as follows:

- i. For the purposes of a job interview for employment, PARTICIPANT may discuss technical information about the sub-system to which PARTICIPANT was primarily assigned, and its input signals and output signals, only to the extent it does not suggest or reveal the overall operation of the system as a whole; PARTICIPANT may not discuss or mention any information about the other sub-systems to which the PARTICIPANT was not primarily assigned.
- ii. In the event that PARTICIPANT desires to disclose more than permitted in clause 1(b)(i), PARTICIPANT may request permission from SPONSOR in writing (including by e-mail) at least 10 business days before any disclosure to permit SPONSOR a reasonable opportunity to file a patent application to preserve SPONSOR's rights to seek foreign patent protection. **The written request must fully describe, in text and/or drawings, the entire subject matter that PARTICIPANT seeks permission to disclose.** SPONSOR will not unreasonably deny permission to disclose limited amounts of technical information, but permission may not be granted for disclosure of marketing or end-use application information. Where possible, SPONSOR may grant written permission to PARTICIPANT in less than 10 business days upon request.

2. Inventions

a. Assignment of Inventions

Proceedings of the 2010 ASEE North Midwest Sectional Conference

At or before the end of the COURSE, I agree to assign to the SPONSOR, without further consideration, my entire right, title, and interest (throughout the United States and in all foreign countries), free and clear of all liens and encumbrances, in and to all Inventions. Notwithstanding the foregoing, the SPONSOR may, in its discretion, agree to provide consideration for certain Inventions through a written agreement between the SPONSOR and the undersigned which specifically provides for such consideration; in all other cases, no consideration shall be paid. The Inventions shall be the sole property of the SPONSOR, whether or not copyrightable or patentable. In addition, I agree to maintain adequate and current written records on the development of all Inventions, which shall also remain the sole property of the SPONSOR. I understand that "Inventions" means all ideas, processes, inventions, technology, designs, formulas, discoveries, patents, copyrights, and trademarks, and all improvements, rights, and claims related to the foregoing, that are conceived, developed, or reduced to practice by me alone or with others during and for the COURSE. The foregoing shall not apply to an invention that the PARTICIPANT developed entirely on his or her own time without using the SPONSOR's equipment, supplies, facilities, or trade secret information.

3. Non-Compete

PARTICIPANT agrees not to engage in any activity that is competitive with any activity of SPONSOR during the course of their relationship and for a period of 12 months after termination of the Agreement. For purposes of this paragraph, competitive activity encompasses forming or making plans to form a business entity that a reasonable person participating in the COURSE would believe may be deemed to be competitive with any business of SPONSOR. This does not prevent PARTICIPANT from seeking or obtaining employment or other forms of business relationships with a competitor after termination of the COURSE so long as such competitor was in existence prior to the termination of the COURSE and PARTICIPANT was in no way involved with the organization or formation of such competitor.

Biographies

William B. Hudson Dr. Hudson has been teaching senior design at Minnesota State University for 8 years. Prior to joining the faculty at Minnesota State Dr. Hudson held faculty positions at Kansas State University and New Mexico State University and industry positions at Lindsay Manufacturing, Sprint as well as serving as a consultant.

Craig O. Thompson, JD, EE, PE. Mr. Thompson directs Thompson Patent Law Offices PC, a patent boutique law firm that provides experienced counsel on offensive and defensive patent matters. Previously, Mr. Thompson practiced law at Fish & Richardson for 7 years, after a 10 year career as a design engineer with Plexus Corp.