Intellectual Property Issues and Capstone Projects

Andy Dozier
University of Louisville
Speed School of Engineering
Electrical and Computer Engineering Department

David D. King
University of Louisville
Assistant University Counsel

Criteria 3 for Student Outcomes of the ABET Criteria for Accrediting Engineering Programs requires that students have an ability to function on multidisciplinary teams, and an ability to design a system to meet desired needs within realistic constraints. The approach taken by the Electrical and Computer Engineering (ECE) Department at the University of Louisville to meeting these criteria is to solicit realistic, team-based projects from industry collaborators. These projects solve industrial problems that are relevant to business needs. They also provide students with industrial experience in design and development of "real-world" solutions to typical problems encountered in electronic system development. One of the main issues associated with these projects is the issue of ownership of Intellectual Property (IP) associated with the project effort. IP can be provided by the industry collaborator to the project team, and the students on the project team can develop IP to the benefit of the industry collaborator. Historically, universities have taken the position that any IP developed by university faculty and other employees is owned by the University. This approach to IP ownership can preclude industry collaborators from participating in Capstone projects. This paper details the approach that ECE has taken to solve this dilemma.

Background

The abstract refers to industry collaborators, as opposed to sponsors for capstone projects. Use of this term is recommended, since Universities normally refer to contracts with government and other entities that engage in research as "sponsored research" activities. Hence, the term sponsor has a very specific meaning in the context of a research university. If the term "sponsor" is used in the context of capstone projects, it can lead to confusion. As a result of this potential confusion, we use the term "collaborator" for a business entity that mentors undergraduate student project teams to design a system for the collaborator that solves real-world industrial problems.

The "General Rule" documented in Section 3.a of the University of Louisville Intellectual Property Policy[2] (IP Policy) states:

> "Except as provided in Section 3.b. [Exceptions], the University of Louisville Research Foundation, Inc., hereinafter referred to as ULRF, will hold all Legal Rights to all Intellectual Property conceived, first used (in the case of a trademark or service mark), or reduced to practice, discovered, or created, by any employee of the University, during his/her employment by the University. The University may also hold Legal Rights to Intellectual Property conceived, first used or reduced to practice, discovered, or created, by any student at the University as outlined in Section 4 of this Policy..."
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> "…To ensure that the University is aware of all such Intellectual Property, all those persons covered by this Policy are required to disclose to the University any Intellectual Property, except those Traditional Works as defined in Section 3.b.iii…"

Policy 4.b of the IP Policy states exceptions for students who independently create IP:

> "Students who independently create Intellectual Property arising out of their participation in programs of study at the University, and that do not result from their employment by the University, will retain the legal rights thereto…."

As can be seen in this IP Policy, most industry collaborators would not be motivated to mentor a capstone project in which faculty and students develop a system to the requirements established by the collaborator, since the University, its employees, or participating students could then assert ownership of any IP developed as part of the project effort. In effect,

the company participating on the project would be construed to be donating their IP to the University by such collaboration. This is a very common problem in most University settings. In order to move forward with outside industry sponsorship of student projects, this dilemma must be addressed. The remainder of this paper will detail how the University of Louisville's ECE Department approaches industry collaboration for capstone projects.

Project Collaborator Recruitment

Execution of a student project begins with recruitment of potential collaborators. At the University of Louisville, all students must execute three co-operative (co-op) assignments with outside industry prior to taking the capstone project course. As a result, the Co-operative Engineering Education Office has extensive relationships with companies in central Kentucky and southern Indiana. These companies have worked with our students, and understand the capabilities of our undergraduate seniors. In many instances, the student co-ops make their supervisors aware of the capstone course. As a result, many of these supervisors offer potential projects to the course instructor.

Agreements and Relationships

In order to prepare for the course, the instructor solicits projects from potential industry collaborators. After meeting with the collaborator to discuss potential projects, the collaborator assigns a mentor for the project, typically a staff engineer with responsibility for the success of the project effort. The mentor generates a two page project description that details the equipment, material, software, fixtures, and documentation that will be provided to the team, high level block diagrams of the system to be implemented, and the functional requirements that must be achieved in order for the developed item to be considered a success. Details of any sensitive or proprietary information that must be protected by the student team and the University are also defined at that time, and incorporated into the project description.

The project description then forms the basis for agreements that are generated and signed by the participating company, the students on the project team, participating faculty members, and the University. The following documents are negotiated and agreed to by the University counsel and the corporate legal staff:

1. Industry Collaborator and University Capstone Project Agreement (Capstone Project Agreement).
2. University Capstone Participation and Release Form (Capstone Release Form).
3. Reciprocal Non-Disclosure Agreement (NDA) (when applicable.)

Capstone Project Agreement

The Capstone Project Agreement states the agreements between the participating company and the ULRF.[3] It also details the motivation for the project:

> "The University desires that the Company support and/or participate in an educational curriculum pedagogy referred to as a "Capstone" design project, in which a team of students works with faculty advisor(s) to apply techniques and processes from the classroom to the "real world" projects of a business entity. This experience will provide students with the opportunity to gain valuable experience while working with industry on an engineering design project…"

The issue of confidential and proprietary information is also addressed:

> "The University acknowledges that in order for the Company to participate in such projects that the individual students and faculty working on these projects will need to be apprised of, and abide by, provisions that address the use and protection of Company confidential/proprietary information and/or Company intellectual property…"

The document then defines the following:

1. Responsibilities of the Parties
2. Intellectual Property Rights
3. Academic Records and Publication/Presentation Rights.
4. Confidential Information
5. Limitations on Liability
6. General Provisions

The document also contains as an exhibit the Project Description mentioned previously, and the Non-Disclosure Agreement, which will be discussed in the following sections.

The document is signed by the Company, the University's authorized signatory, the participating faculty members, and the student team members, since each have IP and other interests that are addressed.

Capstone Participation and Release Form

Each student on the team (Capstone Participant) must sign a Capstone Participation and Release Form.[4] This

form requires the student to acknowledge and agree to the following items:

1. The student willingly participates in the project.
2. Participation in the project is for academic credit.
3. The student agrees to assume the risk of accident or damage to his (or her) person or property as a result of participation in the Capstone Project.
4. The student authorizes the University and its agents to obtain medical care in the event that it is determined that the Capstone Participant is in need of immediate emergency medical attention.
5. The student agrees to remain under the supervision of the University and its agents at all times during the Capstone Project, and to comply with University policies and specific program rules.
6. The student authorizes the University to release the name and any relevant information about the Capstone Participant as deemed appropriate.
7. The student acknowledges that the Collaborator on the Capstone Project may share confidential and/or proprietary information with the University and the students who are participating in the Capstone Project.
8. The student acknowledges that in order for the Collaborator on the Capstone Project to determine that no confidential or proprietary information is being disclosed, and in order to assist the faculty member in evaluating the work of the Capstone Participant on the Project, the Collaborator may need access to the reports that are generated by the project team and grants that access to the Collaborator and accreditation review groups. [These are considered academic records within the meaning of the Family Education and Privacy Rights Act (FERPA).]
9. The student acknowledges that the Industry Collaborator may require that the Capstone Participant license or assign intellectual property rights to the Collaborator in order to protect its intellectual property and proprietary rights.
10. The student releases the University and the Industry Collaborator from any and all actions, …and claims and counterclaims of any kind or nature, …arising out of, or in any way connected with:

    a. The participation of the Capstone Participant in the Capstone Project, and in the activities included in, and required by, the Capstone Project, including transportation to and from the Industry Collaborator site;
    b. The decisions or actions of the University in seeking and obtaining, or in failing to seek and obtain, the above-authorized immediate emergency medical attention; and
    c. Any failure of the Capstone Participant to remain under the supervision of, and to comply with, any instructions given by the University and its employees or agents during the Capstone Project.

This document incorporates the Project Description and the associated Non-Disclosure Agreement (when applicable) as an exhibit. The student reviews and acknowledges this agreement by his/her signature, and the signature of the document is witnessed.

Non-Disclosure Agreement

The Non-Disclosure Agreement details the agreements between the Collaborator and the ULRF regarding the definition of, and handling of sensitive information associated with the project[5]. Specifically, it addresses the following items:

1. Defines "Confidential Information" in the context of the project that will be undertaken by the student team.
2. Defines the maintenance, handling, and trust associated with the disclosure of the "Confidential Information."
3. Defines the receiving parties' obligations under the agreement.
4. Defines the term of the exchange of the "Confidential Information," typically one year.
5. States that no license is granted by the disclosure of the "Confidential Information."
6. Provides caveats on the handling of export controlled information or technology.

Students are introduced to the concept of Intellectual Property and these documents the first week of the semester with a guest lecture by David King on "Intellectual Property Basics." At the conclusion of this lecture, the students are introduced to the specific documents required for their projects. After project selection, the students, associated faculty, the industry collaborator, and the Provost sign the documents for their project. Examples of IP issues are cited in the lecture slides, and IP homework is assigned.

Intellectual Property Ownership

If no unique University facilities or processes are used in the fulfillment of the Capstone Project, the University takes the position that it will not assert any rights to IP that is generated as a result of the project effort. Obviously, if the University took a different position, this would completely demotivate the Collaborator from participating on the project. However, since both the participating faculty member and the students participating on the project can create IP as a result of

their design effort, appropriate access/use by the Company of this IP has to be addressed.

Ownership of the IP generated by participating students and faculty is complex. The University cannot edict that students and/or faculty "give away" their IP. Further, if the NDA is too restrictive, it could restrict the student's ability to gain employment in a company that may compete in the same line of business. If the project involves extremely sensitive proprietary information, it is likely that the envisioned design effort is not a good candidate for a Capstone Project.

In addition to confidential information, in order for the students and faculty advisor(s) to work on the project, they typically need to use Company IP. The Company grants a Non-Exclusive Royalty Free ("NERF") license for use limited to the Capstone Project.

Any IP that is developed in the performance of activities in connection with the Capstone Project by one or more of the students assigned to the Capstone Project team, or by a faculty member, staff member or other employee of the Institution that is not assignable to the University pursuant to its Intellectual Property Policy is defined as "Individual Intellectual Property." "Individual Intellectual Property" is addressed by providing the Collaborator with a NERF license.

Most of the companies that we have worked with have found this to be an acceptable approach to IP ownership. At the collaborator's request, we have also placed in the agreements, statements that preclude the students from using their project-developed IP in a competitive situation against the project sponsor. If the students do not wish to waive their rights in this manner, then they have the opportunity to pick a different project for their team. To date, this has not been a significant issue.

Project Team Formation

Project teams are formed using the Team Maker instrument that has been designed by Matt Ohland and his associates at Purdue University.[6] Team Maker allows ease of formation of project teams. Team Maker data is also used to conduct research into how students learn in a team-based environment. After team formation, project teams pick their projects from the available project descriptions. After picking their projects, each team member then reviews and signs the appropriate Capstone Project Agreement, Capstone Participation and Release Form, and reviews the associated NDA. These documents are then kept on file at the University Counsel's office.

Project Documentation

Student teams must document their design in a project portfolio that consists of three documents: System Requirements Specification (SyRS), System Design Specification, and a Final Report. In addition to the project documentation, students must make a mid-term and final presentation. They must also present their work at a "Demonstration Day" event in which industrial representatives serve as design jurors. All of these documents, presentations, and the judging sheets are used to establish a team grade for the course, and for ABET assessment.

Conclusions

The University's ECE Department has developed a methodology that allows recruitment and conduct of industrial sponsored capstone projects. Students benefit from participation in multiple ways. They learn about IP and its application to their project work; they gain an understanding of how team-based projects are different from their co-op experience; and they participate in the solution of real-world problems for their industry collaborators. Participation also provides students with networking opportunities, which may be useful in gaining employment. The department benefits from enhanced relationships with the stakeholders who hire our students, allows us to gain an understanding of what is required of our graduating students when they enter the workplace, and we are provided with a basis for assessment of many of the ABET student outcomes. Specifically, these projects are very helpful in assessing Criteria 3.c (Realistic Constraints) and 3.d (Multi-disciplinary Teams),

References

1. "Criteria for Accrediting Engineering Programs, Effective for Reviews During the 2012-2013 Accreditation Cycle," dated Oct. 29, 2011, pg. 3, http://www.abet.org/engineering-criteria-2012-2013/, last accessed on 12/16/2011.
2. "University of Louisville Intellectual Property Policy, PER-1.04," dated July 14, 2005, available at http://louisville.edu/hr/intellectual-property.html.
3. "Industry Collaborator and University Capstone Project Agreement," Dave King, Sept. 18, 2011, available at *https://louisville.edu/speed/electrical/*.
4. "University of Louisville Capstone Participation and Release Form," Dave King, Sept. 18, 2011, available at *https://louisville.edu/speed/electrical/*.
5. "Reciprocal Non-Disclosure Agreement," Dave King, Sept. 18, 2011, document available at *https://louisville.edu/speed/electrical/*.
6. "CATME/Team Maker Website," available at https://engineering.purdue.edu/CATME.