Importance of Providing Intellectual Property to Sponsoring Companies When Recruiting Capstone Projects

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Since nearly the inception of the Capstone program at Brigham Young University (BYU) in 1990, it has been our practice to provide intellectual property (IP) rights to project sponsoring companies. This policy has helped BYU successfully recruit and complete 545 Capstone projects from throughout the world. Providing IP rights to sponsoring companies enables BYU to identify appropriate design and build projects even in tough economic times enabling our students to be taught the design process and to help our students learn the practice of engineering. This paper provides a program overview of BYU's Capstone program and its intellectual property history including the experiences gained by students working on industry sponsored projects with intellectual property, and presents recent survey findings demonstrating the importance of providing intellectual property to sponsoring companies when recruiting Capstone projects.

BYU Capstone Program Overview

Brigham Young University's original purpose in developing its Capstone course in 1990 was to develop a partnership between industry and academia so that we could improve the relevancy of engineering education for our students. From a pedagogical perspective, this partnership provided an opportunity for us to address weaknesses in new engineering graduates as identified by hiring managers in industry[1]. Our main learning outcome has been to better prepare our students to successfully practice engineering and meet the needs of companies throughout the world to compete in a global environment. Having our students work on real engineering design and build projects, for a real customer, with real needs, where a substantial educational grant was involved, has been a key to the course's success.

Each Capstone project provides students the opportunity to work on industry-sponsored projects that enable them to learn and apply the design process. Capstone is a two-semester course that includes cross-functional student teams from a variety of disciplines (Mechanical Engineering, Manufacturing Engineering Technology, Electrical & Computer Engineering, Industrial Design, and others). Each team is assigned a faculty coach (either from existing BYU faculty or local engineering professionals who are hired as part-time faculty) who works closely with the student team and a liaison engineer from the sponsoring company throughout the duration of the project.

The Capstone course began at BYU in 1990 with just four projects and has expanded to include approximately thirty industry-sponsored projects each year with a total of 545 completed projects over the past twenty years. BYU has been fortunate to be involved with more than 200 companies from 25 states and 11 different countries with ongoing international efforts.

Projects recruited for Capstone are typically seen by the sponsoring companies as mid to back-burner projects that include approximately 600-800 (design and build) engineering hours. Each Capstone team has access to the expertise of university departments and facilities including significant analysis, CAD, rapid prototyping, machining, and engineering laboratories. Capstone student teams take real-life projects from concept generation and modeling to a working prototype.

Companies that sponsor Capstone projects provide BYU an educational grant of $20,000 which provides an initial budget for each team of $1,500. Approved costs that exceed the initial budget are the responsibility of the sponsoring company. All documentation, drawings, and prototypes created by the student teams are provided to the sponsoring company. In addition, BYU grants all intellectual property developed by the team to the sponsoring company.

History of Intellectual Property at BYU

Intellectual property that might result from the student's work became an issue early in the program that needed to be resolved. In forming a policy, we completed surveys of other universities and of potential and current Capstone project sponsors. These surveys clearly showed that if we did not grant IP ownership to our sponsors we would severely compromise our ability to recruit meaningful projects and also compromise our desired learning outcomes.

Except for one response, survey results from project sponsors were all negative, or very negative, if IP ownership was retained by the University for Capstone projects, even if an exclusive license were granted to the

project sponsor. Sponsor's main concerns centered on the need to get their legal staff involved if blanket IP ownership was not given up-front at the start of a project. From a practical point of view, this would in effect, take the decision making process for sponsoring a project away from engineering management.

One of the most interesting things we learned in our early survey of other schools was that only 12 of the 165 programs that were using industrially sponsored projects had an educational grant of $5,000 or greater and that, in practice, only two of these twelve schools retained ownership of IP. Probably the most interesting fact, however, was that the two schools that did retain IP did only one or two projects a year.[2]

Another interesting fact revealed from the school survey was the response to the question, "Are these (Capstone) projects considered university research or academic course projects?" Only 5 of the 128 programs that responded to this question (and use at least some industry sponsored projects) considered these projects as university research with applicable policies.

Brigham Young University's principle educational role, as has been defined by its Board of Trustees, is to provide outstanding undergraduate education with excellent graduate programs in selected areas, (engineering being one of these areas). This important educational paradigm combined with the results of the surveys from schools and project sponsors helped BYU officially formulate a policy that IP ownership could be given to Capstone project sponsors. An exception to this policy occurs only if the project sponsor does not pay their educational grant to the university.

Once this policy was formulated, documents were created with the aid of BYU's legal staff for use in signing up project sponsors. It took time for both the university and sponsoring companies to become familiar with this approach. Nevertheless, through the years this policy has worked well for BYU and our project sponsors.

We continue to receive strong positive student, alumni, and industry feedback confirming the practicality of the policy in helping to foster the achievement of the desired learning outcomes for the course.

BYU Process for Capstone Intellectual Property

Companies interested in sponsoring a Capstone project at BYU submit online project proposals. Each project is evaluated against criteria that include an emphasis on providing an appropriate design and build experience for student teams and the likelihood for success of the project for the sponsoring company. Once a project is selected, sponsoring companies are notified of acceptance and sent a documentation package that includes an overview letter, sponsor agreement, a copy of the Ownership and Non-disclosure agreement, educational grant invoice, and guide for liaison engineers. The majority of these documents and the proposal form are available on BYU's Capstone website (www.capstone.byu.edu).

The sponsor agreement is a one page document developed by BYU that defines the contractual relationship between the sponsoring company and BYU. In receiving all rights to any new intellectual property the students and faculty coach may develop, the company agrees to pay the educational grant and release and indemnify BYU of any claims resulting from their work on the project. In essence, there is no guarantee for the sponsoring company, but the vast majority of projects are useful for the sponsor. This is a critical part of the process as it provides an opportunity for student teams to make mistakes and learn from these mistakes. This also helps ensure that sponsoring companies are participating as partners in the educational experience for the student team, not in pursuing contracted project work.

In addition, all students, faculty and staff associated with Capstone sign a standard "Ownership and Non-disclosure Agreement" with BYU as part of the agreement between BYU and the sponsoring companies to protect their IP. From a pedagogical perspective, BYU students gain practical experience working on projects with intellectual property where they do not own the intellectual property similar to what they will find working for their future employers. This provides students the opportunity to interact in a project environment which includes the importance of proper communication and documentation to ensure that any developed IP is properly protected. By participating in Capstone, the educational grant is also exempted of all university overhead charges since Capstone is an academic course and not a research program.

On occasion, sponsoring companies want to utilize their own agreements instead of the BYU sponsor agreement. BYU has taken the position that it is necessary to use a simplified one-page standard agreement or the management of nearly thirty different agreements would become overwhelming and detract from the educational purpose of Capstone. In limited instances, we have had to decline project opportunities because companies were unwilling to utilize the BYU agreement. Our experience has shown that most companies are agreeable to the terms of the agreement especially when they retain rights to the intellectual property for the project.

Upon receipt of the documentation package from BYU, sponsor companies complete the sponsor agreement in duplicate and send both to BYU for signature from the Dean of the Ira A. Fulton College of Engineering and Technology. An original signed agreement is maintained at BYU with the other returned

to the sponsoring company. Typically the signed ownership and non-disclosure agreements are also provided to the company from the students and coach for their respective project. However, it is important to note that all capstone students, faculty, and staff sign these agreements. This enables open discussion and disclosure of all projects within the Capstone course. This open environment helps increase the attainment of BYU's learning outcomes for the course and improves the potential for successful projects.

The Capstone External Relations Coordinator and Capstone Administrative Assistant work closely with sponsoring companies to ensure that all paperwork is appropriately completed and that the educational grant is paid. It is typical that a $5,000 deposit be paid by the sponsoring company upon notification of project acceptance with the remaining $15,000 of the educational grant typically paid prior to the project start or in accordance with negotiated payment terms.

Importance of Providing Intellectual Property

BYU recently conducted a brief survey of Capstone project sponsors who had sponsored at least one project during the past five years (2005-2010) to quantify and document the ongoing importance of providing intellectual property when recruiting Capstone projects. The survey included 79 different companies representing 144 projects from 16 states and 9 countries. The survey was sent to 131 project sponsors with 73 responding (56% response rate).

The first question asked survey respondents how important it was for their company to own the intellectual property developed as part of their participation in the Capstone program. Responses are show in Table I. The response was very clear with 97% indicating that it was moderately to very important for them to own the intellectual property when sponsoring Capstone projects.

Table I
Importance of Owning Intellectual Property on Capstone Projects for Sponsoring Companies (n=72).

Level of Importance	% Responses
Unimportant	0
Of Little Importance	3
Moderately Important	7
Important	22
Very Important	68

The second question asked survey respondents if they and their company would be willing to sponsor future Capstone projects if they did not own the intellectual property. The vast majority (83%) of respondents indicated that they would <u>not</u> be willing to support future capstone projects without owning the intellectual property that may come from the project.

The third question asked respondents to consider previously sponsored Capstone projects and asked them to categorize the percentage of projects that they would <u>not</u> have sponsored without IP ownership. Figure 1 illustrates that of the 70 respondents (representing companies who had sponsored from one to twenty five different projects), that the majority of previously sponsored BYU capstone projects would not have occurred if ownership of IP had not been granted to the sponsor.

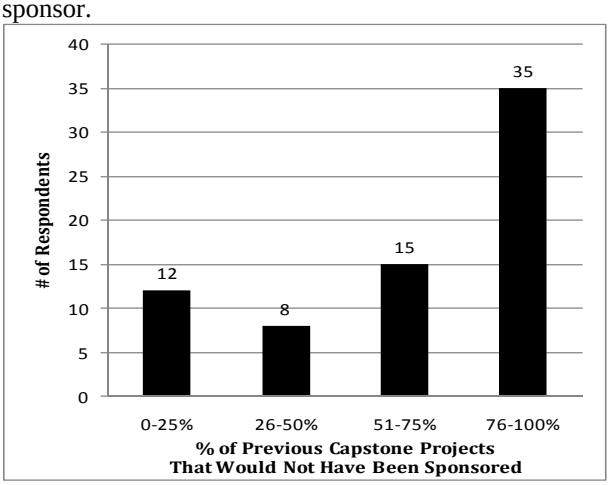

Figure 1: Percentage of Previous Capstone Projects That Would Not Have Been Sponsored by % Group

Overall, the quantitative survey results clearly indicate the significant importance that sponsoring companies place on owning IP when sponsoring Capstone projects. The data shows that many companies currently involved in sponsoring Capstone projects at BYU would not be willing to sponsor future projects without the current policy of providing IP rights to sponsoring companies.

Qualitative comments were also solicited in the survey providing sponsors and liaison engineers the opportunity to comment on the importance of receiving IP rights in connection with each Capstone project. The majority of comments strongly indicated that maintaining IP rights was a necessary element for their involvement as illustrated with the following actual sponsor statements:

- "The ownership of IP by the sponsoring company is a deal breaker for us. We would not have had Capstone project #1 had it not been for this very important issue and we are currently on project #3 with many more to come in the future."
- "One of the primary reasons we invested in the Capstone project was due to the IP policy."
- "Owning the IP was the deciding factor for our company in selecting BYU as a candidate for our dollars."

- "Protecting current intellectual property that is shared with Capstone team members, and owning any intellectual property that is developed by the Capstone team are very important considerations."
- "Ownership of IP is both important inherently, but also serves as a differentiator from other programs."
- "IP rights are a key consideration for most any project of value that we can conceive. Without those IP rights, it is much less likely that we would sponsor a Capstone project."
- "Most projects we consider sponsoring are not the type that would generate valuable IP for our company, but if we did sponsor a project to develop a new product, we would want to own the IP."
- "Intellectual property in the aerospace business is critical and ownership is how we capitalize on it."
- "We funded projects at other universities until we understood the IP advantages of BYU Capstone. I doubt we would fund any future work without the IP arrangement we currently have."
- "I have used Capstone to work on third world development problems. In that arena I wish it were all an open system so that every idea is open to all and can be improved upon by all. If BYU decided that they would only work where BYU captures the intellectual property, I would not be interested in participating."

There were a couple of sponsors who indicated they would support BYU's Capstone program even if they did not receive the IP rights as illustrated below:

- "Typically owning the IP is not paramount to our company but this would need to be assessed on a case by case basis."
- "On occasion our company is involved in product development and may or may not share in the ownership of the resultant IP. Although understanding and managing IP is very important for our company, we would not let the question of IP prevent us from sponsoring a Capstone project with BYU."

A follow-up national survey to the survey conducted by BYU in 1994 on engineering capstone design courses was conducted in 2005[3]. The results indicate a growing trend from approximately 40% to 64% of sponsors owning intellectual property when participating in engineering capstone design courses. This data supports the early and more recent results of the industry survey conducted by BYU which indicates the importance of intellectual property being provided to industry sponsors for Capstone projects. Without this provision it would be difficult, if not impossible, to recruit the necessary design and build industry sponsored projects to support the educational purpose of the Capstone design course within our undergraduate curriculum.

Conclusion and Recommendations

Providing intellectual property to sponsoring companies is a significant factor both in the ability for BYU to recruit Capstone projects and to develop long-term collaborative working relationships with companies throughout the world to enable us to reach our desired capstone course learning outcomes and prepare our students for the practice of engineering. These relationships lead to funded research opportunities for our faculty, scholarships, internships, and full time employment for our graduates. By providing the intellectual property to sponsoring companies we are able to increase both the quality and quantity of sponsored Capstone projects even when facing tough economic times.

Providing intellectual property rights to sponsoring companies is an important element in securing the best possible educational projects for our students. It also has become a differentiating factor when recruiting projects throughout the United States and internationally. BYU continues to experience positive results in our project recruiting efforts because of this practice. In recent years we have been fortunate to receive more qualified project proposals than we can complete each year which enables us to be more selective in determining the projects that will be included within the Capstone course.

In summary, BYU's intellectual property policy benefits our students. Students are provided the opportunity to work on real projects with real consequences and also learn the value that companies place on IP and are better prepared for the normal practices concerning IP that are used in industry.

References

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[2] Todd, R.H., Magleby, S.P., Sorensen, C.D., Swan, B.R., and Anthony, D.K., *A Survey of Capstone Engineering Courses in North America*, ASEE Journal of Engineering Education, April 1995, Vol. 84, No. 2, p. 165-174

[3] Howe, S., and Wilbarger, J., "2005 National Survey of Engineering Capstone Design Courses", *Proceedings of the 2006 ASEE Annual Conference and Exposition*, ASEE, 2006.