

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 577 Capstone projects from throughout the world. Providing IP rights to sponsoring companies enables BYU to identify appropriate design and build projects even in more difficult economic times, enabling our students to be taught the design process and learn the practice of engineering. This paper provides an overview of BYU's Capstone program and its intellectual property history and policy including the experiences gained by students working on industry-sponsored projects with intellectual property. Also presented are recent survey findings demonstrating the importance of providing intellectual property to sponsoring companies when recruiting Capstone projects.

Keywords: intellectual property; capstone; industry; sponsor; project; design; agreement; NDA; BYU

1. Introduction

The Capstone program at Brigham Young University (BYU) was created to teach the design process and to provide real-world hands-on project experience for senior engineering and technology students within the Ira A. Fulton College of Engineering and Technology. The Capstone course was developed in part due to feedback provided by employers of BYU alumni with encouragement to increase student experiences in: real-world design work, communication, project management, leadership, and teamwork [1]. Intellectual property (IP) is very much a part of real world design work and is basically a creation of the mind for which property rights are recognized within corresponding fields of law. Intellectual property typically includes inventions (patents), trademarks, copyrights, and industrial designs, and owners of IP are typically granted certain exclusive rights [2].

During the early years of the Capstone course at BYU, surveys of other universities and of potential and current Capstone project sponsors were conducted. These surveys clearly showed that if we did not grant IP ownership to our sponsors we would severely compromise our ability to recruit meaningful educational projects and also compromise our desired learning outcomes. This led to the creation of a policy that IP rights would be provided to sponsoring companies who sponsor Capstone projects. This policy throughout the years has provided student project teams the opportunity to work on projects sponsored by many different companies

that would not have been available without the current IP Ownership policy.

2. 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 from 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 [3]. 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, 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 577 completed projects over the past 21 years. BYU has been fortunate to be involved with more than 200 companies from 26 states and 12 different countries with expanding international efforts.

Projects recruited for Capstone are typically seen by sponsoring companies as mid to back-burner projects that include approximately 600 to 800 (design and build) engineering hours. In addition, these Capstone projects are of real consequence and use to the sponsoring organization and are not merely busy work for student project teams. Each Capstone team has access to the expertise of university departments and facilities including significant analysis, CAD, rapid prototyping, machining, fabrication, and engineering laboratories. Capstone student teams take real-life projects from concept generation and modeling to a working prototype including documentation.

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.

3. 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 [4]. These surveys clearly showed that if we did not grant IP ownership to our sponsors we would severely compromise our ability to recruit meaningful educational projects and also compromise our desired learning outcomes. Except for one response, survey results from project sponsors were very negative, if IP ownership was retained by the University for Capstone projects, even if an exclusive license were granted to the project sponsor. Sponsors' 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 interesting things we learned in our early survey of other schools was that only 12 out of the 165 programs were using industrially sponsored projects that had an educational grant of \$5,000 or greater and that, in practice, only two of these twelve schools retained ownership of IP. An interesting fact concerning these two schools was that they completed only one or two projects a year [4]. 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 BYU's Capstone projects would not be considered research, but instead design projects and 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. From time to time, additional work by the university is initiated as a result of Capstone design projects in the form of new research with its applicable policies.

4. 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

BYU Capstone Sponsor Agreement	
Date: _____	
Company Name: _____	
Thank you for your support as a sponsor of the Capstone Program, <i>Integrated Product and Process Design</i> , at Brigham Young University's Ira A. Fulton College of Engineering and Technology. We look forward to working with you this year.	
<i>As a Capstone sponsor, with your paid educational grant you retain ownership rights to all products, processes, technologies, and other intellectual property developed by students as a result of their work on your project. Other than that required to complete performance under this Agreement, there is no license granted to Brigham Young University or anyone associated therewith, whether such license is express or implied, to any Capstone Sponsor intellectual property. All students, faculty, and staff associated with the Capstone Program will sign a standard form BYU "Assignment of Ownership and Non-disclosure Agreement," a copy of which is attached. BYU will make reasonable efforts to protect any confidential or proprietary information you or a third party collaborator provide to the team from the time we receive your written notice that the information is confidential. Students and faculty will freely discuss all non-confidential information associated with the project as part of the normal educational activities in the Program. As part of the normal classroom activities, faculty and students will have the right to present information to participants in the Capstone program who are under the "Assignment of Ownership and Non-disclosure Agreement".</i>	
Your educational grant of \$20,000 , for each project, makes the Program possible and will be exempted from all supporting indirect charges (overhead) by the University, so that the full amount of the grant will be available for the Program. If your project requires the Capstone team to travel outside of the state of Utah, we will ask you to pre-approve and pay for those travel costs. In addition, if the hardware costs for each project exceed \$1,500, we will ask you to pre-approve and pay for those additional costs.	
Final presentations will be made at the end of each semester. Faculty and students will have the right to publish and present information concerning the project. If you notify us that protection of patent or intellectual property rights precludes complete disclosure of the project, we will work with you to provide for both protection of rights and appropriate publication. Of course, we will not disclose your confidential information in any such publication.	
The Capstone Program is an educational program designed to help students learn the practice of engineering. Because students are responsible for the work on the project, we can only provide the work of the BYU faculty and students "as is". Students are not considered agents or employees of BYU. <i>BYU makes no warranties, express or implied, as to the condition, accuracy, originality, merchantability, or fitness for purpose of any products, processes or intellectual property developed in the program.</i>	
Because you are receiving any intellectual property developed by your project, as a Capstone sponsor you agree to release and to indemnify BYU, its faculty, students, and agents from any claims arising out of the originality, design, manufacture, or use of any of the products, processes, technologies, or intellectual property generated as a result of the project, unless such claims arise out of the willful misconduct or gross negligence of BYU, its faculty, students, or agents. <i>You agree that BYU will not be liable for incidental or consequential damages or for lost profits resulting from a breach of this agreement, even if advised of the possibility of such damages, and that your exclusive remedy against BYU for any claim you may have against BYU relating to the Capstone Program will be limited to the amount of the educational grant funding the project.</i>	
The Ira A. Fulton College of Engineering and Technology and BYU thank you again for your participation in and support of the Capstone Program, and look forward to working with you in this educational effort.	
Alan R. Parkinson: _____ Dean, Ira A. Fulton College of Engineering and Technology Date: _____	Capstone Sponsor Signature: _____ Printed Name: _____ Title: _____ Date: _____

Fig. 1. Brigham Young University Capstone Sponsor Agreement.

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 BYU Capstone sponsor agreement is included in Fig. 1 and the Assignment of ownership and non-disclosure agreement is included in Fig. 2.

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 as a result of the project, 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 indeed useful for the sponsor. This is a critical part of the process as it provides

**ASSIGNMENT OF OWNERSHIP
AND NONDISCLOSURE AGREEMENT**
(BYU Capstone Program)

The undersigned, in consideration of the opportunity to participate in the Capstone Program at Brigham Young University (hereafter referred to as "BYU"), hereby agrees as follows:

1. I understand that as a result of my work in the Capstone Program, intellectual property in the form of inventions, data, formulae, computer software specifications, products, processes, technologies, patents, copyrights, and other technical and product information ("Intellectual Property") may be developed during the program.
2. I understand that BYU and a Capstone Affiliate or Sponsor ("Partner") have entered into an agreement to work jointly on a Capstone project provided by the Partner. That agreement specifies the party, (hereafter referred to as the "Owner") that will own all intellectual property created as a result of the project.
3. I hereby assign to the Owner all of my rights and ownership interest to such Intellectual Property created as a result of and during my participation in the project. I agree to cooperate with the Owner, its assignee or designee in perfecting rights to such Intellectual Property, for example, by signing any documents that may be necessary to perfect the rights. I also understand that I am not entitled to receive any income from the sale or licensing of this Intellectual Property by the Owner.
4. I understand that in the event the Partner and/or a third party collaborating with Partner discloses to me information that is marked as confidential or proprietary, I will not, without express written consent of Partner or the third party, as the case may be, (1) disclose or publish any part of such information to others for a period of five (5) years from receiving the information; (2) make any use of such information for a five (5) year period except in the course of my participation in the BYU Capstone Program. However, I further understand that I shall not be prevented from disclosing information when I can establish, by competent evidence, that such information:
 - a. Was already known to me at the time of disclosure by Partner or a third party collaborator; or
 - b. Was available to the public or otherwise was part of the public domain at the time of disclosure by Partner or a third party collaborator; or
 - c. Became available to the public or otherwise became part of the public domain after the time of disclosure by Partner or a third party collaborator, but other than through my own acts or omissions in violation of this Agreement; or
 - d. Was lawfully disclosed to me by a party not collaborating with Partner subsequent to the time of disclosure by Partner or a third party collaborator.
5. Immediately upon termination of my participation in the Capstone Program at BYU, I agree to return to BYU all software, records, project notebooks, memoranda, information, data, programs, models and equipment of any nature in my possession or under my control pertaining to the program.

DATED this _____ day of _____, 20_____.

Full Printed Name of Participant: _____

Participant's Signature: _____

Residence: _____

Post Office Address: _____

Witness:

Signature

Printed Name

Fig. 2. Brigham Young University Capstone Ownership and Non-disclosure Agreement.

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 process for educating our students and not just 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 would find working for their future employers. We believe this is an important learning outcome for our students. This also 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 [3]. By participating in Capstone, the educational grant is also exempted of all university overhead charges since Capstone is an academic course for instruction 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 very 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 that may be created as a result of the students and faculty coaches working on the project.

Upon receipt of the documentation package from BYU, sponsor companies complete the sponsor agreement in duplicate and send both copies 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 students, faculty, and staff associated with Capstone 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 students within the course and improves the potential for successful projects.

The Capstone External Relations Manager 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.

5. 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 to project sponsors when recruiting Capstone projects. The survey included approximately 80 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 shown in Table 1. 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.

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 possibly created by the project team. The vast majority (83%) of respondents indicated that they would not 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 not have sponsored without IP ownership. Fig. 3 illustrates that of the 70 respondents (representing companies who had previously sponsored from 1 to 25 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. Specifically, 35 of 70 (50%) of the respondents indicated that nearly all (76% to 100%) of their past projects would not have been sponsored.

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

Table 1. Importance of Owning Intellectual Property on Capstone Projects for Sponsoring Companies ($n = 72$)

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

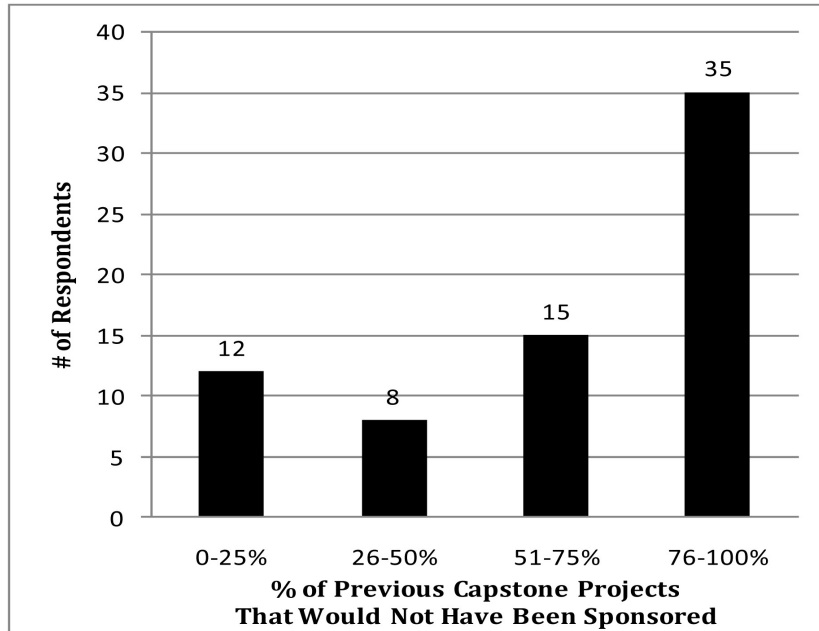


Fig. 3. Percentage of Previous Capstone Projects That Would Not Have Been Sponsored by % Group.

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 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.

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.

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.

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 [5]. 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.

In addition, providing IP rights to sponsoring organizations helps foster innovation and leads to student involvement on projects otherwise excluded from Capstone consideration [6]. 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.

6. 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. As previously noted, these relationships have led 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 more difficult 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 a greater number of 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.

From our experience, Capstone programs within universities should consider the establishment of a policy which would grant ownership of any intellectual property developed as part of the Capstone project to the sponsoring company to help recruit meaningful educational projects for students to work on each and every year [7]. The recommendation to provide intellectual property to sponsoring organizations may be more pertinent to Capstone programs involved in design and build projects

where IP is generally a concern including Mechanical Engineering, Manufacturing Engineering, Industrial Design, and Electrical Engineering. This is particularly true if sponsoring companies provide a significant educational grant to the University in connection with the sponsored Capstone project.

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.

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