

---

# **AC 2011-446: LESSONS LEARNED FROM PROVIDING INTELLECTUAL PROPERTY TO SPONSORING COMPANIES WHEN RECRUITING CAPSTONE PROJECTS**

## **Gregg M. Warnick, Brigham Young University**

Gregg M. Warnick is the External Relations and Intern Coordinator for the Mechanical Engineering department in the Ira A. Fulton College of Engineering and Technology at BYU. He works directly with industry each year to recruit more than 30 funded Capstone projects and provides project management, team development, and coaching support to each of these project teams and faculty coaches. In addition, he continues to focus on increasing international project opportunities for students and faculty. His research and teaching interests include globalization, project management, leadership, ethics, and manufacturing processes. Prior to joining BYU, Gregg worked for Becton Dickinson, a Global Medical Technology Company (1995-2006). In this capacity he worked as a product development engineer, quality engineer, technical lead, business leader and program/project manager managing many different global projects. Gregg received his PhD in Educational Leadership and Higher Education from the University of Nebraska-Lincoln with a Master of Technology Management degree and a BS in Manufacturing Engineering Technology, from Brigham Young University. Gregg also is a Professional Associate Instructor for IPS Learning and Stanford University where he teaches the IPS course Project Management Mastery and the Stanford Advanced Project Management course Managing Without Authority for numerous fortune 500 companies throughout the world. He is a Certified Manufacturing Technologist (Society of Manufacturing Engineers) and is also certified in Planning and Managing Projects (BD University); Ethical Fitness (BD University); Lean Manufacturing (BD University); High Impact Facilitation (Lore International Institute); and Project Management (Saddle Island Institute).

## **Robert H. Todd, Brigham Young University**

Robert H. Todd is a professor of Mechanical Engineering at Brigham Young University and the founding director of BYU's Capstone program, Integrated Product and Process Design. Dr. Todd received his PhD from Stanford University in Mechanical Engineering Design, where he also received a Post Doctoral fellowship. He then taught engineering courses and served in department and college administration at BYU-Idaho (then Ricks College) before spending 10 years in industry in senior engineering and management positions with both the General Motors Corporation and the Michelin Tire Corporation in both the U.S. and Europe. His research and teaching interests include manufacturing process machine design, product design and the improvement of engineering education in a global setting. Since coming to BYU in 1989, he has been the senior author of two manufacturing processes books, one, Manufacturing Processes Reference Guide, a best seller used throughout the world, and more than 100 technical articles. He has served as a department chair and undergraduate coordinator at BYU, a member of the Engineering Accreditation Commission (EAC) of ABET (the Accreditation Board for Engineering and Technology). He is a recipient of BYU's Karl G. Maeser Excellence in Teaching award, the Mechanical Engineering Department's Outstanding Teacher and Rudy Awards, the department's Outstanding Achievement Award, and BYU's Blue Key College of Engineering and Technology Outstanding Faculty award. He is a member of ASME and SAE. He is a life member of ASEE and SME and a Fellow of the American Society for Engineering Education.

# **Lessons Learned From Providing Intellectual Property to Sponsoring Companies When Recruiting Capstone Projects**

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 26 states and 12 different countries throughout the world. Providing IP rights to sponsoring companies enables BYU to identify appropriate design and build projects even in more difficult economic times. The primary purpose of BYU's Capstone program is to enable our students to be taught the design process and to help them learn the practice of engineering.

This paper provides an overview of BYU's Capstone program and its intellectual property history and policy. Also included are some important lessons learned in providing intellectual property to sponsors as well as experiences gained by students working on projects involving intellectual property. In addition, recent survey findings demonstrating the importance of providing intellectual property to sponsoring companies when recruiting Capstone projects are presented.

## **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<sup>1</sup>. 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<sup>2</sup>.

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 intellectual property 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. Throughout the years this policy 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.

## **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<sup>1</sup>. 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<sup>3</sup>. 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 design 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. Design 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. 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, and engineering laboratories. Capstone student teams take real-life design 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 that may be developed by the team to the sponsoring company. This practice is similar to what occurs in industry as most companies require employees to sign documentation indicating that intellectual property developed within the scope of employment or created using company resources is owned by the company<sup>4</sup>.

Engineers typically have a primary role to design or create on behalf of their employer and as such any developed IP is retained by the employer. Capstone utilizes a similar approach pertaining to IP ownership to provide educational experiences for students to better prepare them to work successfully within industry. There may be some individuals, particularly within academia, concerned that we are taking advantage of the students and faculty coaches, by not providing any intellectual property that may be developed as part of the project directly to the students and faculty coaches. However, the focus of Capstone is to teach students to learn and apply the design process and to gain real-world hands-on project experience. Sponsoring organizations help BYU's Capstone program with this effort by providing projects of real consequence and utility to enhance student learning. As a result, IP ownership is retained by the sponsoring organization to provide students the opportunity to work on meaningful projects.

## **History of Intellectual Property at BYU**

Intellectual property that might result from the student and faculty coach'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<sup>5</sup>. 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. The main concern for project sponsors 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 and operations management personnel at potential sponsoring companies.

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<sup>1</sup>. 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. Typically these projects are considered design projects and not research projects.

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 appropriate and applicable policies.

## **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](http://www.capstone.byu.edu)). The BYU Capstone sponsor agreement is included in Figure 1 and the assignment of ownership and non-disclosure agreement is included in Figure 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 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 design 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<sup>3</sup>. By participating in Capstone, the educational grant is also exempted of all university overhead charges since Capstone is an academic course for instruction of undergraduate students 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.

## BYU Capstone Sponsor Agreement

Date:

Company Name:

Thank you for your support as a sponsor of the Capstone Program, *Integrated Product and Process Design*, at Brigham Young University's Ira A. Fulton College of Engineering and Technology. We look forward to working with you this year.

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".

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. *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.*

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. *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.*

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: \_\_\_\_\_

*Figure 1. Brigham Young University Capstone Sponsor Agreement*

**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

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

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 involved 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 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 an additional 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 any intellectual property created when sponsoring Capstone design projects.

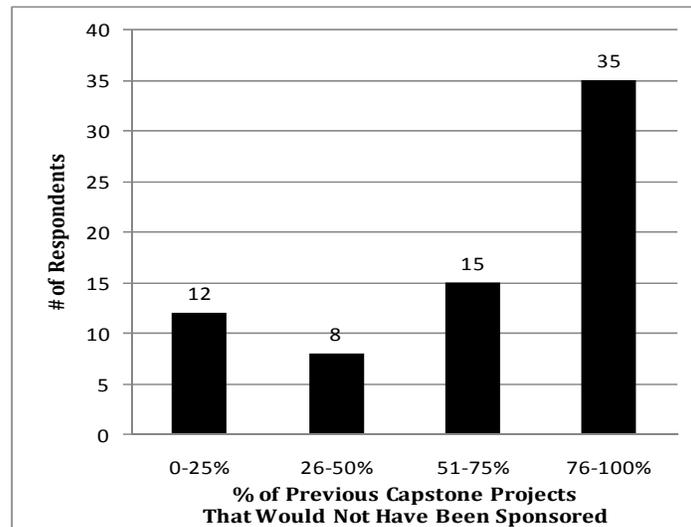
Table 1. Importance of Owning Intellectual Property on Capstone Design Projects for Sponsoring Companies (n=72).

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

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. Figure 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.



*Figure 3. 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<sup>6</sup>. 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 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.”
- “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<sup>7</sup>. 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<sup>8</sup>. 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.

## **Lessons Learned**

The opportunity to work with more than 200 different organizations on 577 Capstone projects over the past 21 years has provided significant learning opportunities. We continue to learn through our successes and setbacks and through ongoing self evaluation and benchmarking efforts with other colleges and universities.

We have found that the old adage about “keeping it simple” certainly applies to intellectual property and Capstone projects. The use of a simple one-page sponsor agreement helps to reduce anxiety experienced by a potential sponsoring organization and also reduces the need for attorneys and other legal personnel involvement. The goal is to keep the decision-making concerning potential Capstone projects in the hands of the engineering and operations leaders and not with the attorneys of a potential project sponsoring company. Our experience has shown

that as soon as any document exceeds one-page in length that it is typically subject to deeper scrutiny within organizations.

Another lesson learned is the importance of maintaining confidentiality and adhering to the provisions of non-disclosure when working on Capstone projects when desired by the project sponsor. Understanding the provisions of corporate practices concerning presentations and publications is important. For example, a couple of years ago BYU students had successfully completed a project for a large multi-national firm with a local sponsoring facility. We received approval from the local general manager to share accomplishments with the local media including television and newspaper.

The project received positive attention and was included in a few local news releases. The university and Capstone administrators were contacted by the corporate office of the sponsoring organization inquiring why the media release had not been approved by their corporate office. We were surprised by this inquiry and told them we had received previous written approval from their company for the news release. They informed us that the local facility did not have the authorization to provide approval for media releases and that any and all such information must go through their corporate office. Not only did we have to remove the information on various websites, but one of the authors was contacted on a Sunday afternoon by a corporate official concerning information posted on a Capstone students' personal blog concerning the project. Needless to say the student was contacted and the material removed promptly. This and other experiences have helped BYU reinforce the importance of ensuring that any intellectual property shared external to Capstone has appropriate written approvals.

As mentioned previously, the goal of the Capstone program at BYU is to teach students the design process and provide real-world hands-on design project experience. To facilitate learning we provide opportunities during the second semester for students to learn from experts in their field including attorneys that specialize in intellectual property and contract law. This exposure provides students an opportunity to understand the importance and implications of working on projects that may involve intellectual property. Since BYU utilizes a two-semester approach for its Capstone design projects, we have learned that it is very important to help students understand intellectual property at the beginning of the first semester and to remind them of its importance throughout the design process. Students also have access to instructors including the Capstone External Relations Coordinator within the University who can provide expertise in dealing with any intellectual property situations they may face as they work with their industrial sponsors on their respective projects.

All Capstone project teams are provided an opportunity to present their project work at the conclusion of each of the two semesters with the inclusion of a project fair at the end of the second semester. The project fair provides Capstone project teams an opportunity to demonstrate the physical results of their project in a setting similar to a career fair. Capstone project teams also prepare presentations that highlight the results of their project work. Since the goal of BYU and other academic institutions is to facilitate and provide learning opportunities for students, these presentations are open to the public. This approach sometimes concerns project sponsors because of potential implications associated with intellectual property. We provide the sponsoring organization approximately two weeks to review what will be presented and work with the team to modify any areas of concern. We have learned that with concerted efforts by the

sponsoring organization and the Capstone project team that most presentations can be modified to eliminate or significantly reduce any concerns in presenting Capstone project results.

At times, a few sponsoring organizations are concerned about sharing any information with individuals external to Capstone. We make sure that all participants understand that certain projects may have restricted attendance. In these situations, we provide opportunities for interested individuals to sign a BYU “Ownership and Non-disclosure Agreement” to observe the presentation and review results at the project fair. This practice in previous years has proven difficult at times to manage because presentations occurred simultaneously in four different rooms and participants moved freely from room to room. The difficulty to ensure that “Ownership and Non-disclosure Agreements” were properly signed by participants was small in relation to the total number of projects but was nevertheless something to be addressed. At the most recent end-of-semester Capstone presentations, any participant that had not already signed a BYU “Ownership and Non-disclosure Agreement” was asked to do so during registration and was given a green colored dot on their name badge to let session facilitators know that they were approved to attend any session that had restricted attendance due to potential intellectual property concerns. Any individual that did not have a green dot was provided an opportunity to sign an agreement in the session or was invited to attend other presentations not requiring a non-disclosure agreement. These efforts significantly reduced management efforts associated with intellectual property.

Typically every Capstone project at BYU includes the payment of a significant educational grant as explained previously. The term educational grant is used purposely within the sponsor agreement to help sponsoring organizations recognize that no guarantees are provided with any sponsored project. The term “educational grant” helps BYU avoid legal contractual implications, but also in identifying sponsoring organizations that are interested in partnering with us to teach students the design process while working on real projects with real consequences.

The Capstone program at BYU continues to evolve each and every year to improve outcomes for our students and sponsoring organizations. It is only through a willingness to evaluate our current practices regularly that enables us to learn and improve for future years.

## **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 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 projects that will have the greatest educational value for 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<sup>9</sup>. 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.

## Bibliography

---

- <sup>1</sup> Todd, R. H., C. D. Sorensen, and S. P. Magleby, Designing a senior capstone course to satisfy industrial customers, *Journal of Engineering Education*, Vol. 82, No. 2, 1993, pp. 92-100.
- <sup>2</sup> WIPO, What is intellectual property? <http://www.wipo.int/about-ip/en/>
- <sup>3</sup> Gorka, S., J. R. Miller, B. J. Howe, Developing realistic capstone projects in conjunction with industry, *SIGHTS 2007 Annual Conference*, Destin, Florida.
- <sup>4</sup> Radack, D. H., Intellectual property: yours or your employer's, *Getting Results...For the Hands-on Manager*, November 1997, [http://findarticles.com/p/articles/mi\\_m0GSZ/is\\_11\\_42/ai\\_53710428/](http://findarticles.com/p/articles/mi_m0GSZ/is_11_42/ai_53710428/)
- <sup>5</sup> Todd, R. H., S. P. Magleby, C. D. Sorensen, B. R. Swan, and D. K. Anthony, A survey of capstone engineering courses in North America, *ASEE Journal of Engineering Education*, April 1995, Vol. 84, No. 2, p. 165-174
- <sup>6</sup> Warnick, G.M. and R.H. Todd, "The importance of providing intellectual property to sponsoring companies when recruiting capstone projects", Special Issue on Capstone Design, *International Journal of Engineering Education*, in review (expected to appear Vol. 27, No. 5, Sep/Oct 2011).
- <sup>7</sup> Howe, S. and J. Wilbarger, 2005 national survey of engineering capstone design courses *Proceedings of the 2006 ASEE Annual Conference and Exposition*, ASEE, 2006.
- <sup>8</sup> Business link, Practical advice for business, <http://www.businesslink.gov.uk/bdotg/action/detail?itemId=1074300698&type=RESOURCES>
- <sup>9</sup> Todd, R. H. and S. P. Magleby, Elements of a successful capstone course considering the needs of stakeholders, *European Journal of Engineering Education*, Volume 30, Issue 2, 2005, pp. 203-214.