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UNIVERSITY AND INDUSTRY COLLABORATION IDEAS BENEFICIAL TO BOTH

It can be argued that the importance of relationships between today's Engineering/Technology Educators and Industry has never been greater. The engineering/technology field is changing at a staggering rate and in order for educators to keep pace, connections with industry are absolutely necessary. Industry, also, is looking at ways to stay competitive, not only in the domestic market, but internationally. There are two very strong arguments for encouraging bonds between Universities and Industry:

- Traditional funding for education from the government has decreased, or at best has fluctuated, over the past few years. Because of this, universities are looking for alternative ways to maintain research and development programs, laboratories, and even faculty so that they might attract the best and brightest students and retain the students that they currently have. Also, ways to stretch current budgets without diminishing the quality of the education must be explored.
- Industry realizes that the universities are essential for training the workforce that they will someday employ. It is therefore essential that the education that they receive be current and relevant to their chosen field. It can be further stated that existing employees, through either undergraduate or graduate studies can also further their education and make themselves more valuable to their employers. This being said, universities want to provide their students with practical experience so that they are better prepared to start their careers. Business, likewise, wants students with relevant knowledge thereby reducing training time.

It is for these reasons, and others, that the amount of University/Industry collaborations have increased in the last ten years. As Powers et al. (1988) stated "the most fundamental reason that institutions of higher education want to collaborate with businesses is to improve their financial situations. Another reason education institutions seek collaborative relationships with businesses is to promote advancement of knowledge by improving the quality of instruction and research. Businesses enter cooperative relationships first of all to meet corporate product, service, or management needs."¹ While there are some potential hazards to this, the possible benefits are too great to ignore.

First, let us look at some of the potential or perceived drawbacks to collaborations. Massachusetts Institute of Technology President Charles Vest, while testifying before the United States House of Representatives in 1998, stated "Over the long term, (private) collaborations can have a transforming effect on the ability of institutions to attract high-quality faculty (members), to encourage faculty (members) and their students to interact more closely with industry, and to design curricula and academic programs better attuned to the needs of industry and the challenges we face as a nation."² However, he went on to say "universities should work

synergistically with industry, they must not be private industry. Unless universities retain their culture, base of fundamental research, and educational mission, they will not have value to bring to the partnership.”² Universities are viewed, and rightfully so, as an impartial institution open for free thinking. If a partnership starts to shift the entire focus to the needs of one company, then the possibility of picking up other sponsors would diminish. To enter into a partnership that could be perceived by others as simply for financial gain would be disastrous for the university. Any collaboration must be thoroughly thought out with all possible negative aspects investigated. The following discussion highlights possible ways for universities and industry to collaborate for the benefit of both.

The largest collaboration (in terms of dollars) occurs in the area research and development. A common complaint of United States engineering and construction firms is that they fail to spend as much money on research and development as their international counterparts. Construction firms in Japan typically spend a predetermined percentage of their yearly revenue on research and development, while few, if any in the United States spend anything. Universities on the other hand, while often using time tested programs for their research, can use some guidance as to which direction to take their program. It must be remembered that the universities ultimate goal is to prepare the students for their future careers. The best way to do this is to keep their education relevant by maintaining the most current means and methods. It is these students who will be most attractive to prospective employers and help keep the department placement percentage high.

Collaborations in research and development (R&D) can involve a few thousand dollars to tens of millions of dollars. As stated above, there are many questions that must be resolved before the partnership is set. Who has the rights to any product that results from the research and development? Are the students or university held liable for mistakes or erroneous conclusions? Who has publishing rights and at what time? How is the funding to be split? Will students be asked to work on projects that have a very narrow use in the industry that they have chosen? There are several known cases of professors directing students to perform senior projects in areas that were not going to be useful in their upcoming careers, but were designed to further research for the professor. The university must still isolate itself so that it does not appear to be simply an extension of a business. The phrase from Mr. Vest “they (universities) must not be private industry”² alludes to this potential problem. Careful thought must be put into any collaboration so as to keep the university’s impartiality and values intact while the business gets value for its investment.

University laboratories typically do not have the money to equip themselves as major firms do. However, they are often better equipped than the testing facilities for smaller firms. In either case, this lends itself to a possibility for paid testing/research. Smaller companies can augment even basic R&D with university resources while larger firms may direct the university into very specific areas (it should be noted that larger firms in house spending on R&D far exceeds those funds shared with universities).

While the area of research and development is the “big dollar” area of collaborations and receive the most attention, these are difficult for most smaller university’s to obtain. Smaller partnerships can be of equal or greater importance and are much easier to convince businesses to participate in. Participation in these programs are beneficial to both the universities and industry without the business having to make a substantial financial commitment.

Two such options are internships (full or part time employment for one semester) and cooperative education (students typically alternate full time employment and full time education on a semester by semester basis). This is extremely beneficial to the student as they can start applying lessons learned in the classroom to “real world” applications, investigate possible career paths, earn money to help offset college costs, gain business contacts, and make themselves more attractive to potential employers upon graduation. Businesses like these programs for several reasons:

- First, students may be hired during a period of peak workload, when additional staff is needed for a short duration and a new full time employee is not justifiable.
- Current students with some technical background can be trained to the company’s practices without having to change previous training contrary to the new firms practices.
- Even if the pay scale is the same for comparable full time employees, not having to pay benefits makes the students more cost effective.
- There are immediate benefits from their investment.
- Potential employers can “scout” potential full time employees for the future.

Universities also benefit from offering internships and cooperative education (co-ops). A listing of companies that have or are currently working with the respective departments are posted on numerous university web sites and serve to attract potential students. Students who are willing to extend the amount of time it takes to receive their degree, or who need the extra financial boost in order to attend college, find programs are particularly attractive.

A rather novel, but intriguing, development is the notion of “Faculty Co-ops”. These programs are designed for faculty members who might be lacking practical experience in a particular area. In this case the university pays the faculty member while the business pays the cost to hire guest lecturers to cover the professor’s classes. While rare, this gives the faculty much needed experience in the private sector and better prepares them for classroom lessons. This approach, while having some obvious benefits, is not widespread and poses many hurdles (such as getting both the university administration and business to approve the idea).

A more common area for faculty involvement is consulting. While many may disagree, faculty consulting is extremely important and needed in the engineering/construction field. While trying not to insult any program, a professor in, shall we say, a pre-1800 English Literature could probably use lecture notes from twenty years ago and still have a meaningful class discussion. However, in engineering/construction, while basic concepts and theories might not have changed over the same period of time, lecture notes from five years ago on the processes would probably be obsolete. In this field, the ability to effectively teach relies not only on skill, but relevance. While reading trade publications and attending conferences can help the instructor understand, nothing yet has come along that replaces actually doing it yourself. It should also be noted that

consulting work not only keeps faculty members in touch with outside firms, but would in all likelihood help meet or keep in touch (networking) with other professional firms (or individuals) that they would be dealing with.

Another recent development was the teaming of industry and a university to create an entirely new program. In August of 2005, the American Council of Engineering Companies (ACEC) and Chicago's Northwestern University announced the creation of a new graduate program in business management catering exclusively to the A/E/C professional. ACEC Vice President stated "We are extremely proud of this collaboration with Northwestern University in being able to offer a new management degree never before available, but of vital interest to our members."³ Northwestern University will coordinate the program by utilizing both its McCormick School of Engineering and the Kellogg School of Management. Northwestern faculty will teach the courses, but ACEC will maintain a presence by helping give direction on course content and access to industry practitioners.² Such an arrangement should prove beneficial to ACEC and its contributing members with a minimum of financial investment, with Northwestern having the distinction of developing a new program.

Collaboration could also lend itself to the possibility of students working on projects that could advance their studies (Senior Projects) and careers. By a business donating material, money, or time (or combinations of any of these) the industry gives the students the possibility of advancing their studies far greater than could be possible if they simply used conventional methods. The students can work with actual products and those professionals who either developed them or promote their use. Past experience with this type of arrangement has proved to be very successful in that the faculty is not necessarily an expert in this particular area. By working with those who promote/develop the product, the student often gains insight to the product in far greater depth than the faculty could impart. The business often gains in that the students and faculty can give the product a different spin and can try things that the industry did not envision. The business typically does not ask much (if anything) in return. At most, it usually involves attending the presentation or receiving a copy of the report and test results. In this case, the student clearly gets the most out of the arrangement.

While the discussion so far has related to corporate partnerships with universities, partnering with the individuals (who undoubtedly work for some of these businesses) can be of equal importance.

One true measure of a program's success is how well it prepares its students to enter the workforce. By having advisory committees made up of industry employers, the university can receive immediate feedback on how its graduates are performing. The advisory committee can also be a wealth of ideas on how a program, or a particular subject can be improved to better prepare the students for the workplace. On a recent meeting with members of an advisory committee, several of them pointed out a particular area in which the graduating students appeared to be weak. Once the meeting was over, the faculty immediately examined the related classes and looked at ways to improve the areas pointed out as deficient.

As is often the case, once class assignments for the full time faculty members are distributed, all of the classes offered may not be covered. In other cases, the budget may not allow the hiring of

another full time faculty member. In cases such as this, part time “Adjunct Faculty” or “Guest Lecturers” are often brought in to fill the void. These people are often either retired professionals with decades of experience, or people with full time jobs in the field who bring with them a wealth of “real world” experiences and current practices. A firm with an existing relationship with the university is an excellent source for guest lecturers, and hiring a guest lecturer from a firm in which you do not currently have a relationship with is an excellent way of starting one. In either case, the hiring of guest lecturers not only benefits the students, the university and the lecturers’ employer (who will undoubtedly list the teaching experience on the qualification package) as all will receive immediate and possible long term benefits.

A smaller offshoot to guest lecturers would be guest speakers. While the selected use of guest speakers can be useful to any institution, smaller programs have more to gain. Larger programs with large staffs typically have faculty teach in specialized areas (i.e. – structural design), while smaller programs have to rely on faculty teaching a variety of unrelated classes (such as land drainage and structural design). While the faculty are undoubtedly hired in these cases based upon their ability to teach a variety of courses, they are probably not “experts” in all of these fields. In cases such as this, bringing in a guest speaker to talk about one particular area can really help clarify the topic for the students. In other cases, bringing in an outside speaker to talk to the class about how the lessons taught relate to “the outside world” often brings renewed interest to the students. Also, if the invited speaker can afford the time, guest speakers are often very enthusiastic about the prospect of talking to the students.

In the areas of program advisors, guest lecturers, and guest speakers, it will likely be up to the faculty to find quality people. One excellent source are graduates of the program who have distinguished themselves in their careers. Who better to advise the faculty and speak to the students than someone who has been through the program and knows its strengths and weaknesses? Former classmates, coworkers, and trade association acquaintances of the faculty and administration are also excellent sources for “volunteers”. It should be pointed out that those professionals with ties to the university are typically much more receptive to volunteering. However, most people are intrigued with the prospect and of working with the university and its students and readily volunteer.

An area often overlooked for is the use of trade associations for either partnering with or using to obtain partners. The example above with ACEC and Northwestern University is a perfect example of collaboration between a university and a trade association. While this type of occurrence is rare, there are other more easily obtainable relationships. An example of a trade association actively promoting limited partnerships is the American Institute of Steel Construction, Inc. (AISC). While AISC encourages educator participation within its organization, AISC also promotes an “Adopt-A-School” program between schools who offer structural steel design classes and steel fabricators. The program “matches fabrication companies with universities offering steel design courses. The fabricator may offer shop tours to student groups, NASCC sponsorship for faculty, internships or co-ops, or ASCE chapter involvement among others.”⁴ While the benefits to the university are obvious, AISC points out that the benefits to the fabrication shop include:

- Involvement with a local university will project an image of a highly progressive company.
- The involvement with a local university provides enormous public relations opportunities to your company. Public relations often translates into business opportunities with local A/E firms, general contractors, owners and developers.
- Adopting-A-School will expose students to the structural steel industry and, through your company, to the wealth of technical information available from AISC. Students who have had this exposure will confidently select steel as a design solution, thus increasing the use of your products.
- When steel is selected as a design solution, both your capital investment and market share are protected.⁴

Because of this training, students and educators see how steel design translates into fabrication. Fabricators, on the other hand, might directly benefit from meeting potential employees and indirectly by helping to influence future engineers and architects who have now seen steel design in the classroom and steel fabrication/erection in the field. By providing the students these opportunities, the fabricators could possibly influence the selection of steel as a building material from these students later in their careers.

In order for these options to succeed, great effort on the part of the university is mandatory. In order to attract corporate collaborations and individual help, it is the responsibility of all in the department to develop relationships. While university presidents, chancellors, and deans will probably be heavily involved in bringing in larger corporate partners, it will undoubtedly be the responsibility of the department heads and faculty to maintain healthy relationships that ultimately benefit the students. Partnerships with smaller firms and individuals not involving large financial packages will undoubtedly fall upon individual faculty members and department heads, making their ability to attract the potential partner equally important.

Bibliography

¹ Powers, D. R. , Powers, M. F., Betz, F., and Aslanian, B. *Higher Education in Partnership with Industry*. Jossey – Bass Publishers, 1988

² ASEE PRISM – February 1999 – “Building Strategic Partnerships”

³ American Council of Engineering Companies – The Last Word, August 19, 2005

⁴ [http://www.aisc.org/Template.cfm?section=Learning Opportunities](http://www.aisc.org/Template.cfm?section=Learning%20Opportunities)