

Corporate-University Partnerships?

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Introduction. For the last two decades corporations have been playing an increasingly important role in academic research, especially in engineering. Contributions range from providing steering-type guidance to financial sponsorship. A typical approach is an industry-membership research center located at a university; the center most often addresses a relatively well-defined problem area that is important to the members. The university-side can be a single school or several institutions with complementary research skills. Some areas of engineering research have developed particularly strong one-firm-and-one-researcher relationships – electrical engineering and computer science offer numerous examples. This “whitepaper” explores a new generation of Corporate Partnership that builds on this one-to-one relationship. Major engineering-driven companies, even whole industries, are moving rapidly to create a new model for interaction. It is both more formal and more comprehensive. It has mutual benefits for both parties, with little, or no, downside risks. Unfortunately, construction research does not seem to be part of this new wave. What are the implications of these trends, and the potential situation of lying outside the boundaries of these partnerships? Would construction engineering and management research significantly benefit from being included? What can and should we do?

Typical Corporate-University Relationships. More than fifteen years ago, NSF led the charge to create research centers that more directly involved industry. Corporate letters of support and even industry memberships were requirements for competitive success. Several other research agencies developed similar industry-participation expectations. Let’s call this first form of relationship “type 1.” Another form of company-university relationship is a one-to-one tie between the firm, often its research labs, and a key university researcher; these relationships have probably existed since the advent of modern engineering education. Some researchers have an uncanny ability to move back and forth from corporate to academic environments. This second form of interaction will be called “type 2.”

Type 1: Many-to-Many and Many-to-One. All of the NSF Engineering Research Centers (ERCs) and NSF Industry/University Cooperative Research Centers (I/UCRC) require corporate participation. Some of these are focused at one university, but many are multi-university based. The *Construction Industry Institute* (CII) at UT-Austin and the *Center for Integrated Facilities Engineering* (CIFE) at Stanford University are examples within the construction research domain of a type 1 relationship. One goal of the I/UCRC program is to use the federal money primarily as the seed funding to get the center established; since the purpose is to perform research important to industry, the expectation is that the member companies will provide continuation funding. The ERCs have higher-percentage and longer-term NSF funding, but these centers are also expected to graduate to other funding sources, including a large portion of industry support. Interestingly, neither CIFE nor CII started with federal seed funding. Further, none of the several ERC proposals focused on construction was ever awarded; the closest was the ATLSS Center at Lehigh University.

The requirement of the NSF ERCs and I/UCRCs for type 1 relationships has been largely successful. The companies and university researchers work together in defining and advancing the research. Several centers graduated as expected and continue healthy involvement with the industry participants. It is, however, reasonable to expect this model to evolve. The companies have had many requests for involvement and memberships, so much so that they are now being

more deliberate in evaluating their participation and continuation. Some companies have indicated that a passive position is not acceptable and that they need an even stronger role in setting the research agenda. Look to this type of center membership to further evolve in the next few years.

One issue that is particularly significant to the corporations is access to proprietary information, especially by the other member companies. The research centers often must pay close attention to addressing this issue during the formation period. A related issue is anti-trust. The litigious nature of some high-technology sectors (reference the current Microsoft anti-trust case) can make forming the industry consortium problematic. A research center must therefore often be deliberate in framing the research agenda around the “pre-competitive” portions of the technology.

Type 2: One-to-One. A second type of university-company relationship is the single researcher (or small research team at one university) working closely with one firm. The number of variations is obviously enormous, yet the central feature is the continuity of interaction and funding. The funding may be on a project-by-project basis, a programmatic thrust, or may even include graduate fellowships and donations. Intellectual property issues are often complex and handled differently in different relationships. The new generation of corporate-university relationship, which will be discussed next, has grown from the many positive experiences in this one-to-one realm.

A New Generation Partnership. Both companies and university researchers have certainly benefited from these past associations, yet there is definitely room for improvement. Both CII and CIFE, for example, are in their second decade and are actively addressing questions of structure and outreach to corporate members; both centers have new directors who are leading these reassessments. As one might expect, the firms regularly evaluate the value-added of continued membership and at what level of involvement or financial commitment. It appears to this observer that the companies are driving a change in the corporate-university relationship toward more and broader involvement – the goal is a truer and more enduring partnership.

New Circumstances, New Goals. Engineering-driven companies now find themselves in new circumstances and with modified goals. The first and most obvious concern is that they cannot find enough educated manpower to satisfy their human resource needs. Projections for the next several decades do not indicate that this situation will improve. These firms have also looked harder at the effectiveness of their recruiting activities and have found room for considerable improvement; in particular, recruiting at a large number of schools has not proven to be the best strategy. Most are reaching a similar conclusion, they must concentrate on a smaller number of key programs. Firms are paring down their interview sites by as much as 75%. They, in turn, see an increased need to be visible and involved on the remaining campuses.

Firms have also examined themselves to determine their core competencies. What activities are essential for them to maintain and what can be outsourced? Even some of the most technology-focused companies have recognized that some of the Research and Development (R&D) should be performed by others. Since the D has arguably more competitive implications, it is often the R that makes more sense to allocate outside – universities are an obvious alternative.

A Prototypical Partnership Agreement. Exhibit A provides a prototypical Company-University Partnership and represents what we are starting to see in growing numbers. Both the recruitment and research goals are included. The participation of the company’s personnel in the activities of the university can go well beyond what we currently encounter. Loaned Executives and participation in high-school recruiting are two examples of how deeply a firm can become

engaged in the human resource side. There are also provisions for company mentors and an aggressive co-op/intern program. On the research side, there are several unusual dimensions. Companies look for a stronger role in advising students during their research periods and in turn expect to provide more fellowship-type funding for graduate students. In this example agreement both sides are looking toward opportunities to commercially develop the funded research. More subtly, the firm is also looking at the possibility of combining its own intellectual property with that developed by the university research to fuel a start-up in the university's research park.

There is no question that agreements such as this one go well beyond the typical, corporate-university relationship of today. It is more formal and more comprehensive. It is driven by the needs of the company to hire high-quality, well-educated graduates. These graduates are in extremely high demand. By getting closer to the university, the company can also positively influence curriculum definition and student development. Perhaps the most significant change is the company's strong reliance on the university to perform research that might have previously been done in-house. This research linkage is central to the long-term health of the partnership. There seems to be a small groundswell of interest in establishing key university programs and establishing formal agreements – firms with greater technology focus seem to be pushing hardest for these partnerships.

A Thesis (Realities) for Construction Research. None of the proposed Corporate-University Partnerships that I have encountered to date include provisions for linking to construction academic programs, either for recruiting students or for furthering a research program. Corporate partnerships will likely become increasingly important to our educational and research programs. Corporate philanthropy is being aligned with these partnerships. Federal dollars for engineering research will become scarcer, and industry support will be more important. What federal funding that is available, will test the validity of the research program by the degree of industry support and its enthusiasm.

As construction researchers, we are in real danger of being left behind. We need to better understand this trend and how we can better engage our industry. We need to seek out positions in partnership agreements where construction research can be a contributor. Most importantly, we must work with the technology leaders from our industry to form our own technology-based partnerships.

Conclusions. This whitepaper suggests an emerging trend toward formal and comprehensive partnerships between our research universities and the engineering-driven companies that rely on our graduates and research products. Not all industries, and not all companies within any industry, will participate equally. The hypothesis is offered that construction educational and research programs may not be participating at all. That cannot be a good thing! If this does become a major mode of corporate-university interaction, then we need to find mechanisms and opportunities to participate.

Discussion Points:

- ◆ What are the implications of these trends?
- ◆ Why do we find ourselves outside these evolving partnerships?
- ◆ Would construction engineering and management research significantly benefit from being included?
- ◆ What can and should we do?

Exhibit A – A Prototype Partnership Agreement

A Technology Partnership Between *The Company and The University*

Vision:

The Company and The University will work together to attract and train the finest engineering graduates nationally and internationally to jointly expand the state-of-the-art areas of interest directly related to the interests of The Company. This partnership will practice continuous quality improvement and adapt as necessary to evolving priorities.

Mission:

The University will collaborate with The Company in pursuit of mutual goals and interests in the following areas:

➤ **Human Resource Issues**

Executive in Residence: The University's College of Engineering will provide an opportunity for a Company executive to be placed in residency at The University. This loaned executive will have amongst other duties significant management responsibility for the Company/University strategic partnership.

Education and Curriculum Development: The partnership will work in tandem with the following academic departments addressing issues of concern:

- ◆ Electrical Engineering
- ◆ Computer and Information Sciences
- ◆ Industrial and Systems Engineering

This list is understood to be fluid, and reflects the current research and commercial interests of The Company.

New Employee Recruitment: A significant goal of the partnership is to create first-hand knowledge of The Company among students; that is, prospective employees of The Company. Key activities of the partnership for progress toward recruitment goals will include:

- ◆ The building of key faculty relationships
- ◆ Access to students in laboratory settings
- ◆ Aggressive recruitment of interns for The Company
- ◆ Primary access to databases on career service activities

Freshman Recruitment: A goal of the partnership is to pursue in tandem the recruitment of high school students for the engineering programs at The University. The Company personnel will work with key faculty from The University in introducing prospective students to the Company/University special programs and career opportunities within The Company. Efforts will focus on:

- ◆ *Honors students*
- ◆ *Students from Science Magnet Schools*

The partnership will also explore the possibility of designated mentors from The Company.

Recruitment of International Students: Focussing on The Company's geographic commercial priorities, the partnership will recruit both undergraduate and graduate students to The University, in order to provide prospective employees for The Company in regions of interest.

Internship and Co-op Programs: The partnership will focus on developing interest in prospective careers at The Company through on-going formalized programs at The University. Internships and Co-op opportunities will involve undergraduate and graduate students, as well as both domestic and international students.

Continuing and Executive Education: The partnership will work with executives at The Company to define solutions for the corporation's continuing and executive education needs.

➤ **Research and Product Development**

Joint Research Teams: Joint research teams will be developed between The Company and The University scientists and engineers, focussing on topics of common interest and in effect developing The University laboratories that are an extension of The Company's research resources.

- ◆ Develop specific University research projects related to The Company's long-term goals
- ◆ *Utilize internship and co-op programs to develop lasting research relationships*
- ◆ Develop visiting programs encouraging geographic exchanges of partnership personnel
- ◆ Utilize post-doctoral researchers, as they prepare for their academic careers, on the joint research teams

The Company Business, Product and Research Goals: To the extent allowed by The Company's proprietary needs and The University's conflict of interest issues, University faculty and researchers will be briefed on corporate research priorities and challenged to create new paths and products of priority to The Company.

Opportunities will be provided for joint research teams to extend and refine The Company's products and processes

New Ventures: As a product of partnership efforts, research collaboration will inevitably lead to opportunities for exploiting new technologies.

- ◆ A review process will be established to examine new research developments at The University, with an eye toward licensing opportunities
- ◆ The University's Research Park Corporation will be reviewed as a potential Company site for technology start-ups, thereby utilizing The Company's existing infrastructure in the University's region.