Panel

Industry-University Partnerships: The Wave of the Future?

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The need for close collaboration between industry and universities has resulted in a trend towards industry-university partnerships in software engineering. This need for collaboration has been caused by two separate trends in academia and industry. On the one hand, universities are in stiff competition for the best students, and have experienced a reduction in funding from traditional sources, such as government grants. On the other hand, industry is under stiff pressure to attract graduates with state-of-the-art skills and to retool its current workforce. Industry members recognize the unique role that the universities can play in both preparing students for the workplace and enhancing the skills of professionals already on the job. Moreover, universities want to provide students with industry experience so that they will be better prepared for their careers, and industry organizations welcome students who have practical experience to go with their relevant course work.

The benefits of such collaborations are obvious. The university establishes a close working relationship with industry partners and, in the case of both short courses and graduate degree programs, has a steady source of qualified students. The industry organizations get excellent cost-effective education for their staff, helping the organizations in meeting long-term learning objectives.

There are also some risks. There can be unrealistic expectations on both sides. The university might view industry solely as a source of students and revenue, and may not be willing to adapt their
curriculum to industry needs. Industry organizations may believe that their investment gives them the right to define the academic program, or they may view universities solely as a cheap source of training.

In this panel we will discuss the factors contributing to the success and failure of industry-university collaboration. We will discuss several models of successful collaboration. We will also discuss whether it is possible to bridge the gap between theory and practice, and if so, how.

Kathy Beckman

Kathy Beckman is corporate training manager for software process improvement training at Computer Data Systems, Inc. (CDSI), a recognized leader in systems integration and systems development for government and commercial customers nationwide. She is responsible for the design, development, and delivery of SEI/CMM Level 2 and Level 3 training to CDSI's software managers, technical staff, and CDSI customers. Beckman leads CDSI's industry-university initiative; she develops partnerships with universities to deliver CMM-based software process management training both in public classes and on-site.

Beckman is a charter member of the SEI Working Group for Improving the Practice of Software Engineering Education and Training. In conjunction with Nancy Mead of the SEI, Beckman authors the SEI special report SEI Directory of Industry and University Collaborations with a Focus on Software Engineering Education (CMU/SEI-96-SR-011). She is the government and industry co-editor of FASE, an electronic newsletter for software engineering education and training. Beckman is a member of the Software Process Improvement Network (SPIN) Training Special Interest Group in Washington, D.C. She is past president and life member of B-WISE (Baltimore-Washington Information Systems Educators, Inc.), one of the nation's largest technical training professional associations.

Position Statement:

My focus is on software engineering training, specifically CMM-based Level 2 software process management training. My perspective is that of an industry training manager attempting to market an internally developed training program to a larger audience. My experience with collaborations is as follows.

I currently participate in one formal university collaboration to deliver CMM-based Level 2 training, and I am working to establish two additional collaborations in 1997.

In my experience, there are five phases to a collaboration:
1. Explore possibilities
2. Establish the collaboration
3. Launch collaborative activities
4. Evaluate results
5. Decide the future.

In Phase 1, we explored possibilities for collaboration with university contacts that we made through presentations to the SEI Education Conference, to professional organizations, and through other networking contacts. We also made "cold calls" on universities with strong programs in continuing education for software professionals. We searched for common goals: revenue generation, enhanced credibility, expanded course offerings. We looked for a "fit" between our business unit and theirs, between our training program and their programs (certificate or non-credit) for software managers.

Once we had a potential match, we went to Phase 2. Here, we identified points of contact within the university's business unit (academic department or continuing education enterprise). We worked with our points of contact to determine the collaboration's form and level of contractual formality, and, most important, to articulate its goals. We documented the results in a memorandum of understanding (MOU) with standard contractual terms agreed to by both organizations. This phase took 3-6 months. Our first collaboration was with the University of Maryland University College (UMUC) located in College Park, Md.

We then launched our collaborative activities (Phase 3) according to the schedule agreed upon in the MOU. UMUC advertised the training session, registered students, and provided classroom facilities;
CDSI provided CMM Level 2 training materials, conducted training, and gave 30 days of post-training technical assistance.

After our training, we jointly evaluated results (Phase 4). These included metrics from the student evaluations (both end of session and 60-day follow-up). We also gathered and documented lessons learned in debrief sessions with the trainers and with our university point of contact.

Following our evaluation, we tackled Phase 5. As business partners, we needed to decide whether to continue our collaboration in its current form, expand the collaboration to take advantage of other business opportunities, or end it when its term expired. We have agreed to extend our MOU with UMUC for an additional 18 months in its current form.

Here are my conclusions to date about industry-university collaborations for software engineering training:

- Collaborations make good business sense for both parties.
- Collaborations take time to grow.
- Collaborations offer industry an entree into the growth market of job-related training for software managers.
- Collaborations build bridges to education partners for software organizations heavily dependent on a continuously re-educated software staff.

**Neal S. Coulter**

Neal S. Coulter is professor and former department chair of Computer Science and Engineering at Florida Atlantic University, Boca Raton, Florida. His previous employers include the Software Engineering Institute, IBM, Los Alamos National Laboratory, Siemens Stromberg-Carlson (through a contractor), and Boeing. He is editor-in-chief of Computing Reviews and of ACM’s Guide to Computing Literature. He is an ACM Alternate Representative Director to the Computing Sciences Accreditation Board, a past member of the ACM Education Board, and past chair of the American Federation of Information Processing Societies Education Committee. He received a PhD degree in information and computer science from the Georgia Institute of Technology. He has extensive experience in the design and delivery of software engineering educational programs in academic and industry environments.

**Position Statement:**

I believe that the key component of industry-university joint programs is a continuing relationship active at various levels of the participating organizations. At Florida Atlantic University, we organized an Industry Advisory Committee with members from nine major corporations. (In our case, the companies or divisions were all local ones.) When we organized, we had no particular agenda, but software engineering education quickly emerged as the prime issue. From that recognition, we designed and executed a multi-year, multi-corporation successful education program. (This project is reported in “Current Practices, Culture Changes, and Software Engineering Education,” Computer Science Education 5, 211-227, 1994.)

Some general recommendations for building a fruitful relationship are:

- Form an umbrella industry group for focus, but also pursue individual projects with its members and with other companies.
- Pick the right industry people. They must be respected, technical people with direct lines to upper management. Some may be vice presidents, but don’t compete with the university president’s advisory committee.
- Let (insist) an industry person chair the committee.
- Involve the faculty judiciously.
• Get high-level management support in both the university and in industry; get industry representatives on campus often, have them meet the president, provost, dean, and so forth. Make it an industry-university project.
• Find some key industry supporters and let them help you with other companies.
• Don’t just ask for money from industry. Find a project of mutual benefit; the money for it will come.
• Make the interaction pervasive (adjunct faculty from industry, faculty to industry, graduate student committee appointments, short courses by faculty).
• Develop as many faculty/industry relationships as possible to insure informal and continuing developments.
• Involve industry in curriculum development, degree program development, and accreditation.
• Get high-powered industry friends on campus for accreditation visits and programs reviews.
• Recognize that companies are for-profit organizations and want a return on investments.
• Deliver. Faculty who do not deliver should not play any more, at least not visibly.
• Be creative. The standard university model will not always work.

Some general observations:
• Companies are eager to form university partnerships.
• Cultural differences are an advantage, not a disadvantage. Otherwise, why would industry be interested? But reinforce the mission of a university when needed.
• Expect some clashes due to the cultural differences.
• Expect some faculty and industry partners to push the limits.
• Expect some companies to be more active than others and some to have more money than others. Never drop a partner over money; many of them will help in other ways, and they may get rich later.
• Recognize that no one can control what will happen once a lot of links are formed, but try to keep focus on projects as needed.
• Be aware that the advisory committee has great value for its industry members. Many of them will form business relationships there. Some of them may join your university later or join other companies represented on the group. Do not underestimate this feature.

Soheil Khajenoori

Soheil Khajenoori is a professor and director of Master of Software Engineering Program at Embry-Riddle Aeronautical University. During 1988-91, Khajenoori worked on a half-time basis with GPT Stromberg-Carlson, a major telecommunications company, for the development of software engineering competency. His responsibilities included development of a software engineering training program, integrating CASE into the product development life cycle, and participating in software development activities (e.g., analysis, design, evaluation) as a consultant to the projects. Currently, Khajenoori is working with Motorola Paging Products Group and McDonnell Douglas Space Division on the personal software process paradigm, and software process improvement initiatives with individual and small teams. In addition, he has been a consultant to major companies on software engineering subjects such as training and technology transfer issues. Khajenoori has been principal investigator or co-principal investigator on fifteen research projects and has published a number of articles on software engineering subjects.
Position Statement

Although it is an acceptable premise that collaboration between universities and industry can be beneficial to both, many companies are skeptical of collaboration with academics because of the risk. Hence, as a risk management strategy, building and defining a collaboration model is imperative. It has been my experience that such a collaboration model should at least address the following potential success factors:

- Definition of common goals and objectives:
- Identification and tracking of project risks
- Establishment of project ownership
- Careful planning and tracking of project progress
- Establishment of commitment
- Frequent communication

Nancy R. Mead

Nancy Mead is a senior member of the technical staff in the Community Sector of the Software Engineering Institute, Carnegie Mellon University. She is currently involved in the development of professional infrastructure for software engineers. She has also served as director of education for the SEI from 1991-94. Her research interests are in the areas of software requirements engineering, software architectures, software metrics, and real-time systems.

Prior to joining the SEI, Mead was a senior technical staff member at IBM Federal Systems, where she spent most of her career in development and management of large real-time systems. She also worked in IBM's software engineering technology area, and managed IBM Federal Systems' software engineering education department. She has developed and taught numerous courses on software engineering topics, both at universities and in professional education courses. She has a BA and MS in mathematics from New York University, and a PhD in mathematics from Polytechnic Institute of New York. She is a senior member of IEEE and IEEE Computer Society, and a member of ACM. She has served on numerous professional boards and committees, and is an international speaker.

George O'Mary

George O'Mary is a principal product system training instructor at McDonnell Douglas in Long Beach, California. He has a bachelor of arts in accounting from Bellarmine College in Louisville, Kentucky. O'Mary is currently in the core software engineering process group and has over 20 years experience in the design and presentation of technical training. OUMary has also completed the TickIT Lead Auditor Training Course for ISO 9001 offered by Lloyd's Register.