Establishing Long-lasting Relationships between Industry and Academia

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Abstract

So how can industry and academia work better together to produce graduates who not only understand the theory and practice of software engineering and process improvement, but understand the challenges, and have ideas for solutions? This paper will address these issues and serve as a basis to generate additional ideas.

1. The Issues

All too often while speaking at conferences, we hear people from industry saying that "the students coming out of college these days do not have the skills we need...". While that often is true, we propose a partial solution to this problem that is actually quite straightforward. Industry and academia need to establish long-lasting relationships, so academia can educate the emerging workforce in what industry needs. Industry needs college graduates who understand what quality software means, and to not only understand software processes, but how to improve them.

One element that universities and businesses have in common is budget constraints, especially in today's economy. Just like many businesses have cut back drastically with discretionary spending, so have many universities, perhaps even more so. As we know, professional conferences are very expensive; so are specialized training courses in what-ever your field of expertise may be. Now, in computer science and other information technology-related fields, the body of knowledge we need to know is extremely dynamic and very quickly becomes outdated. The technology used now, both hardware and software, was not even invented when many of us professors were in graduate school. So, much of what we teach in our current curricula is mostly self-taught. If we are lucky, we have been able to attend a training course on the topic we are teaching, but more likely, we had to learn it on our own. So how can dedicated faculty get the training they need to properly educate the future software engineering and software process professionals? By having industry establish more partnerships with universities, both informally and formally

Informal Alliance

Industry spends a great deal of money on training their personnel, from sending employees to conferences and to professional development seminars, to paying for a formal college degree. Many of the seminars held to train employees are held on-site, in which case either consultants are brought in to provide the training classes or they are held by the company's own staff. Very often, consultants charge on a per-person basis, but they also may charge based on a range of people, for example a fixed fee for between 20 and 25 attendees. It is this last case that we would like to address here. Would you consider that the next time you have an on-site training class, you invite your local professor to attend at no charge? What better way to help ensure that the college you recruit from teaches the material that you want your future employees to know? What would it cost you? Another set of training materials and a lunch? Or if they do charge by the person, is it worth it to you to pay this incremental cost of educating a professor? Probably so.

Formal Alliance

Establishing a more formal alliance is another option that may be even more worthwhile for everyone involved. This type of an alliance can take numerous forms. Would you consider funding a trip for a professor to a conference or for a course? Would you consider having your organizations' personnel guest-lecture at the university? How about providing tours of your company to faculty and students, so they can better see what you do, and see the environment in which they might work? Have you considered having the faculty work at your company for a period of time, perhaps over the Summer break?

One of a faculty member's challenges is developing real-world examples and exercises that are both meaningful and challenging to the students. Do you think your organization could provide material and examples that professors can use in their courses? That would be extremely valuable, to allow professors to use rich, meaningful material as example, assignments, and case studies. You could remove anything confidential,

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but provide information that we can incorporate into our classes.

Some companies have formal programs that involve professors, from establishing visiting positions ranging from a several month appointment to lasting several years. One of the authors was fortunate to be involved in such an alliance several years ago, spending five weeks during the Summer as part of a major organization's faculty partnership program, working in one of their major software testing labs. This experience was invaluable.

2 Benefits to the Faculty and to Industry

At the time, one of the authors was considering offering a new class for the university, a class related to software testing and process improvement. As part of the preparation for the class, a goal was to learn current practices and to become familiar with the processes and tools that were being used in industry. What was it like being a full-time software engineer in industry – what challenges do they face, which tools are being used, what is it like being a project manager of software engineering initiatives? How did the organization integrate process improvement initiatives into their business processes? What were some of the best practices to facilitate process improvements in organizations? What were some of the biggest obstacles to impede change? And, what were they doing to overcome these challenges?

A major goal was also to strengthen the relationship between my university and the organization. We could read the books, but wanted to know more, to improve understanding and to bring this knowledge into the classroom.

As part of the company's faculty partnership program, I was able to interview and observe the software engineers in their daily work. I was also able to discuss issues with software project managers. In addition to process improvement, I was interested in software quality and software testing. One of the highlights was that I spent several hours learning about usability testing from their usability specialist. An unexpected benefit was that he taped me in their usability lab performing a usability test on a web site, and I use the tape in my classes to illustrate the process of a formal usability test. The company also paid for me to attend several training classes to learn to use two vendors' software products.

As a result of the alliance, I was able to obtain the training I needed to prepare to offer the new course. In addition to the technical training I received, I obtained a better understanding of current business software process improvement and software testing challenges. I offered the new class the following term, with the class comprised of students from both the information systems in the college of business and from computer science in the college of engineering. They worked in teams and I made sure that two students were from information systems (business) and the other two students were from computer science (engineering). The students from both colleges had to work together as a team. This class proved to be invaluable to the students, and to me. In addition to the technical and business knowledge each student gained, the students learned to gain a new understanding and appreciation of each area (business and engineering), and learned to communicate in ways they did not do before.

The organization that provided the "faculty internship" benefitted by strengthening their alliance with my university and increasing their recruiting success through better student awareness of not only how their company operates, but process improvement and testing-related careers. Students then considered these areas as career choices, which they had not done in the past. Potential hires became more suited to the organization's needs, with students obtaining offers for summer internships and for full-time positions upon graduation.

An immediate benefit to the organization was that they now had potential employees already interested in them, and had a good understanding of their processes and expectations of that company. Plus, if I were using an example in class, why would I not use what I learned for that particular company? So, it turned out to be a good advertising and recruiting extra for their company.

Related benefits.

During my stay in industry, one of the managers contacted the chief operating officer at one of the leading providers of automated software testing tools, to ask them to donate software to my university. By doing so, everyone involved would benefit: the university would receive top-of-the-line testing tools to use in my course, the organization would be able to hire recruits that have experience with automated testing tools, and the provider of the automated testing tools would be getting their software in the hands of future software testing decision makers. Meanwhile,

independently, the software company began to establish a formal program with additional universities, using my work as a model.

After working with this organization for about a year, they announced their new program, a program designed to provide software and training materials to assist academic institutions to develop their technical curricula. My university was the first institution to become part of the program and the first to receive their donation. In my class, I used their web applications testing software, their web load testing software, and their product that manages requirements, holds test plans, and tracks defects. Other companies have donated software (and hardware) to my university for us to use in our classes. The point is that many companies are kind enough to donate their products to colleges and universities for classroom use, but may not do so unless we ask. So, why don't we ask? We should.

3 Challenges and Suggestions

It was an enormous task, and it was just me doing all this. So, if software companies would like to donate software to a university, they must be prepared to provide extensive training and support. Otherwise, the program will probably fail. In universities where there are multiple faculty involved, it would improve the chances of success, but this will not always be possible. It might also be attractive to have faculty from other disciplines, for example business information systems and computer science.

To successfully build a course and incorporate the software into the curriculum, it takes a great deal of time. At least in my case, I did this in addition to my normal teaching load. Needless to say, I was very busy. So, what would also greatly help the probability of success, is for those organizations interested in working with their local professors, to provide funding to the university for release time. What this means, is that if the professor is teaching two or three classes per term, funding could be provided to the university to pay the professor's salary for one course, so that they will be teaching one less course. What I need most, is time. At a number of universities, if the economy is in a downturn, teaching loads (the number of courses a professor teaches per term) increase. So we may be teaching even more than usual, not less. Will this cost industry money? Absolutely. But, what is it worth to you to be able to locate qualified college graduates? Think of all the money industry spends on training, once employees are hired. Why not spend the money up front, as an investment in both your organization's future and the future of the emerging college graduates? (Depending on your country, there may even be tax advantages for donations…)

Another option is for industry to provide money for faculty positions. This would effectively pay a salary (or salaries) for a year. But this type of situation is not permanent, so if you are trying to attract new faculty, you may not be as successful as if you had permanent funding. Having said that, some faculty like to work in visiting positions for a year or two, perhaps taking leave from their university. A permanent option is to establish an Endowed Chair position. This position would be funded by a company, and is one of the more expensive options, but perhaps more successful. In such a case, an organization would donate an enormous amount of money, and the interest on that amount funds the position, on an annual basis.

If your university has a Master's Degree or Ph.D. program, then graduate students might be able to work with the faculty members on projects. Not only would such endeavors aid the success of the project, these projects could, in turn, become a masters or doctoral thesis. It might even help to attract grants to your program.

4 It Is Not Just Industry That Needs to be Agile

Agile development, process improvement, and testing methodologies are practiced around the world in organizations. But, it is not just industry that should be paying attention – academia should be involved, as well.

"All over the world, universities and colleges have been gradually rethinking how their organizations and infrastructures can be more agile. The thought is that if institutions are more flexible, they will be better able to support and promote entrepreneurial thinking — a long-term trend. At the University of Florida, the Innovation Academy acts as an incubator for students to plan and develop products and businesses, and even seek external funding." [NMC15]

Entrepreneurship

Additionally, an increasing trend in universities is focusing on Entrepreneurship, providing "incubators" and "hot-houses". These are areas where typically students involved in software engineering, can work (and sometimes live). They are not in a classroom, but

are located buildings that are set up with significant technology resources, and advisors, to help them think through their ideas for creating products, and bringing them to market.

What a collaboration opportunity! Who could be involved? There are so many possibilities:

- college of engineering: developing the software
- college of business: marketing, accounting, finance, information systems
- industry: providing guidance, partnering, providing funding. Then, maybe hiring them, or buying out their product…

5 Additional Initiatives and Ideas

We now describe several additional examples of initiatives that the authors have been involved in, to help generate further collaboration ideas. While some of these real examples focus more on software testing than process improvement, the core ideas are there, to generate thought to help academia and industry strengthen their ties, for the benefit of both.

An ERP vendor provided their software, and a major consulting firm hosted it, and provided training materials for the college.

The Chief Financial Officer of a major multinational computer technology corporation was speaking with the Dean of the college, and asked how he could help the college. This company specializes in developing and marketing computer hardware systems and enterprise software products, particularly its own brands of database management systems. Currently, the faculty have been struggling with their individual classes, trying to develop an ERP system for their own course. Some faculty developed their own version of an ERP system, with limited success.

The company provides technical training, but not business process training. So, they partnered with a major consulting firm to help the college, and the consulting firm is not only hosting the site for the college, but working with the college to provide training materials for us to use in our classes. Over the Summer, faculty from all disciplines of the college will work together to establish a plan to have the key courses build on each other, not duplicate material, and expand and integrate the material for a progression of courses throughout the college. This not only takes a commitment from these two companies, but also commitment from the college. This does directly translate into a financial commitment from all involved. The ERP focus will allow students to truly understand how processes work and interrelate. Only then can they even think about improving them.

Leveraging academia for reviewing and enhancing competency development

The Quality Assurance and Testing business unit of a global Systems Integrator was being regularly challenged by its clients to showcase productivity improvements by designing and deploying solution accelerators, test harnesses and automation capabilities aligned to the client's need and environment.

While traditionally, the business unit was investing close to 5% of its revenues on the effort and productivity improvements were being 'seen at places', it was still grappling with finding a scientific way to establish a meta framework for competency development, that not only brought to clients 'state of the art' practices and tools, but also allowed the business unit to have a standardized, consistent approach.

A distinguished retired Professor from one of Asia's leading engineering schools was engaged on a retainer basis to study projects on the ground, map specific competency needs that would create value for clients, and then engage with the business unit's Project Managers and the relevant client's 'Single Point of Contact(s)' to establish more 'bespoke' frameworks. Through a detailed process of shadowing, the Professor was able to quickly perform time and motion studies, understand competency gaps resulting in delivery gaps of services and eventually ways to address and fix them. In the long run, this engagement not only enhanced the overall maturity of the business unit, but also helped it realize its full potential of capabilities.

An Independent Testing Organization's dilemma about bringing a 'Business Face' to testing

Having clocked phenomenal growth, specializing in the banking and financial services testing services, the firm was challenged with finding a way to build more 'Business Leadership' amongst its testers. This was all the more critical given that most key IT leadership roles (those who bought and consumed these services) amongst its customers, namely banks and insurance companies, were held by people who have had a formal business leadership role in the past.

What emerged was a focused MBA in Management of large QA organizations, with specific emphasis on banks and financial institutions.

Partnering with a leading business school, the Program was designed to be an 'industry first'. Half of the graduates were employed by the independent testing organization, while the others were recruited by the competition firms in the industry.

In the words of one of the key leaders, this was a way of giving back to the industry. Also, doing so, enabled the organization to position itself as a 'true Market leader'.

Joining hands with academia to get engineers to be industry ready.

A global start up that focusses in bridging the Knowing-Doing Gap amongst software testers, has started exploring and extensively collaborating with leading engineering and technical schools to ensure that these graduates are industry ready. In the past, once the people graduate, it would take 3-6 months before they could be considered productive. In this 'new model', that duration is expected to be shortened to 1 to 2 months. The collaboration includes design and launch of a common Test Lab, where students get assessed and get to work on real work like projects, after the assessment. They are also expected to shortly benefit from a curriculum that focusses on Quality Assurance and Testing as a major discipline, even at the undergraduate level.

6. Conclusions

Clearly, both industry and academia can benefit by working together more closely.

What better way is there to get to know the faculty at your local colleges and universities? What better way is there to forge alliances between industry and academia? What better way is there to help ensure that you can recruit students that will better meet your needs? There are probably a lot of professors that would like to work with you!

References

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