

# Hot-Syncing Industry and Academic Research and Education

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## Abstract

This paper describes efforts currently underway at the University of Wisconsin-Milwaukee (UWM) which “hot-syncs” industry’s R&D needs with academic research. An important element of our efforts is the recently established Graduate Internship Education Program designed to help develop expertise in the specific technical needs of industry. The program matches graduate students with industry researchers to both enrich their studies, and link industry research with academic resources. An overview of the program mechanics, administration, and student recruitment is presented. The benefits afforded by this program, for both the employers as well as the students, are discussed. The program has been in existence since 2002 and initial results indicate that it has been very successful in helping identify academic need for research topics that support economic development.

## Introduction

In the existing literature, there are few success stories dealing with partnerships between academia and industry. Kelley (1996) describes a productive partnership in polymer education in the state of Ohio between Akron University and the Case Institute of Technology. This partnership led to the establishment of the Edison Polymer Innovation Corporation to aid state development by transferring the results of research accomplished under state support, with matching funds provided by federal and industrial sources.

Bagchi-Sen (2001) focuses on the trends in university-industry linkages in the Canadian Biotechnology industry. The author explains the role the government has played in the development of university-industry relationships, the factors influencing such collaboration, and

the role of government support in university-industry partnerships. De Ramirez et al. (1997) describe the Manufacturing Engineering Education Partnership project that was sponsored by Department of Defense's Technology Reinvestment Program. They show that all constituents involved in the program: students, faculty and industrial partners, benefited from the academic/industrial interaction. The impact of the interaction described was essentially on the curriculum, but it suggests benefits to the industrial partners beyond the involvement of undergraduate students.

The Graduate Internship Program (GIP) discussed in the paper is different from the partnerships discussed above in the sense that we do not transfer research results from academia to the industry. Instead, we are uniquely developing the research technology at the industrial site, through a graduate student working under the supervision of an academic advisor and an industrial advisor. This internship program is intended to expand academic learning beyond the traditional classroom and laboratory setting, combining both the art and science of engineering and computer science.

## **Overview of the Graduate Internship Program**

UWM is a major urban university and enjoys close proximity to several large manufacturers located in the Southeastern (SE) corner of the state of Wisconsin. The metro Milwaukee area is home to many major corporations such as Briggs & Stratton, GE Medical, Harley-Davidson, Johnson Controls, Rockwell Automation, and many others. UWM graduates enjoy high demand for their services. Upon graduation, over 70 percent of our engineering graduates are employed in the SE part of the state of Wisconsin, indicating that our students are highly valued by the industry.

The cooperative education program for undergraduates at UWM enjoys a 40-year history, with 73 percent of the undergraduate engineering students participating in cooperative placements or internships. The Graduate Internship Program was launched three years ago to provide graduate students with an opportunity to be involved in industrial research, and to build more meaningful partnerships between the College faculty and surrounding industry.

The program involves teaming faculty with industry for robust, meaningful research by graduate students under industry and faculty supervision. This partnership not only enriches the intern's graduate studies but also provides a strong link between industry research and academic resources. The program helps provide balanced training during the early years of a student's professional development, and is designed to expand academic learning beyond the traditional classroom setting.

The GIP supplies companies with students whose qualifications exceed those of an undergraduate intern. The students come in with a solid and broad foundation in engineering or computer science. Employers can influence the student's course selection and area of expertise to fit the needs and interests of their company. Thus the employer helps develop an engineer with the education and skills to fit the specific needs of the company, and the student receives valuable work experience.

Each internship involves pairing graduate students with industry for robust, meaningful research by graduate students under industry and faculty supervision. The research topic is negotiated between industry and the faculty advisor to enhance scientific and technological understanding by producing publishable discoveries as part of the graduate thesis requirements. Every intern placement has a written plan for publishable results.

Unlike the traditional model wherein the research is conducted at the university supported by the industry, the GIP involves student working at the sponsoring company's facility. This was done because it was felt that there are certain technical aspects of every organization that are specific to the organization's work and cannot be taught in the classroom. These aspects can be learned only through direct, on-the-job experience, working with professionals who are already successful in the field.

The program allows for industry to benefit from the cutting edge research underway in the university setting. Graduate interns bring that knowledge to their industrial partner. The university also benefits by the information shared about industry interests and challenges, as faculty looks for new areas of exploration. Graduate interns help bring that information to their faculty advisors. It is evident that the networking opportunities afforded by the program for graduate students, faculty, and industry are tremendous.

## **Program Administration**

The program is open to current/prospective graduate students in the College of Engineering. The students are required to have an accredited Bachelor of Science degree in Engineering or a related science field. The program aims to direct students with specialized technical backgrounds to companies facing difficulties finding qualified graduates for job openings requiring those skills. The students are identified based on their area of interest matching the sponsoring company's interest. The potential students are then interviewed by the sponsoring company to identify the best candidate for the position.

As part of the internship agreement, the student work for 20 hours per week at the company's site (or approximately 1000 hrs/year). The company makes a one-year commitment, renewable

with the same or a new graduate student. The candidates are recruited locally and nationally. Once in the program, the student is actually employed by UWM, which is paid about \$32,000 per year by the business. The money is used by the university to cover student's tuition, a monthly stipend and other benefits. Each graduate intern also signs a confidentiality agreement that is mutually acceptable to all parties involved, namely, the company, the university, and the student.

The academic and industrial advisors work in conjunction to insure that high quality work is conducted, and to maintain the integrity of the academic content of the joint work between the university and industry. This is achieved through connecting every scheduled industry/university project to a particular graduate student's program of study including a thesis. The high expectations for the quality of the student's work are the same as those for regular theses conducted by other graduate students at the university. The students are encouraged by the faculty advisor and the industry supervisor to select appropriate coursework that can enhance the student's knowledge and capabilities related to the joint industry/university work.

## **Benefits for Employers**

The internship program enhances recruitment by providing employers with an excellent recruiting tool. This is a wonderful opportunity for employers to train and observe students at work before making a commitment to hire them permanently. The informed choices, made both by the interns as well as the employers, helps lower turnover rate and improve retention.

The interns serve as excellent campus ambassadors that can enhance an employer's visibility and reputation when they return to campus and share their experiences. It is also an opportunity to develop communication and understanding between the university and the employer, allowing for the employer's contribution to the educational process.

## **Benefits for Students**

Besides the above-mentioned benefits to the prospective employers, the GIP also offers several benefits to the students. These include: (i) gaining challenging work experience with nationally and internationally known companies, (ii) gaining a graduate (Master's or Ph.D.) degree while staying in touch with industry needs, and (iii) being able to network and develop contact for full-time, post-master's or post-PhD. positions.

The program also helps enhance retention as financial pressures for our diverse graduate students are eased. Participating students inevitably attain full-time employment after the internships because of the time and money the company invests in training the individual. Our

students tell us that the promise of a good job is strong motivation to undergo the rigors of graduate technical training. We see that the promise of exciting research topics paired with industry experience is a strong motivation for many graduate students. While majority of the student's currently in the program are pursuing a Master's degree, recently couple of interns have also decided to continue on with the program to pursue a doctoral degree while being supported by their respective employers. Some of the companies currently participating in the program include Harley-Davidson, ReGENco, Briggs & Stratton, Chirch Global and others. More information about the GIP program can be found on the web at

[http://www.uwm.edu/CEAS/CareerServices/employers/finding\\_grad\\_intern.html](http://www.uwm.edu/CEAS/CareerServices/employers/finding_grad_intern.html)

Finally, it may be noted that this concept is replicable nationally, wherever faculty has an interest in connecting with applied research in industry.

## Conclusions

An overview of the GIP is presented which matches graduate students with industry researchers and establishes linkage between industry research and academic resources. The program fuses the student's coursework and theoretical knowledge with the practical application of skills to address specific technical needs of the industry. By presenting the student's with an opportunity to apply their coursework in an industrial setting, the program allows them to gain a deeper and more concrete understanding of the field. The interns participating in this program are uniquely prepared to make an immediate economic contribution upon starting employment with the industry.

## References

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