Improving Engineering Management Graduate Student Success through Advisory Board Partnerships

Dr. Saeed D. Foroudastan, Carey Snowden
Middle Tennessee State University

Abstract

The Engineering Management concentration of the Master of Science in Professional Science (MSPS) degree program at Middle Tennessee State University (MTSU) was designed to provide Middle Tennessee's booming manufacturing industry with skilled graduates trained both in both engineering methodologies–including PMI Project Management, Six Sigma, and lean manufacturing–and in business management. Students in this program learn business and engineering skills in the classroom, then apply them in the field through class projects and a complex capstone internship, which takes the place of a traditional thesis. Thus, the Engineering Management program requires strong industry partnerships for the education and graduation of its students.

The MSPS Advisory Board, which consists of local industry leaders and program alumni, acts to grow and maintain these critical industry partnerships. The Advisory Board's role is 1) to provide the class-projects and internships required for the students' successful careers and 2) to ensure that the curricula stays leading-edge and covers the needs of regional employers. By leveraging the experience and knowledge of the board, the program has been able to expand the opportunities for internships for its students and for industry collaborations with its faculty. In this paper, we discuss the roles of the Engineering Management internship class and of the Advisory Board in improving student success, particularly in internship and job placement.

Introduction

Professional Science Master's Degrees (PSMs) were started in the late 1990's to bridge the gap between science and industry and educate students in both advanced Science, Technology, Engineering, and Mathematics (STEM) topics and business management. These degree programs are dependent on regional industries for both curricula input–to make sure the students are learning the leading-edge technology that employers need–and for internships, which take the place of the research thesis in traditional Master of Science programs.[1]

The Master of Science in Professional Science (MSPS) degree program at MTSU was started in 2004 to provide middle Tennessee with a best-educated professional STEM workforce. The degree program requires students to take 21 credit hours of graduate-level coursework in their concentration and 15 credit hours of MSPS Business Core classes. All but one of these MBA-level core classes were designed for the program and are instructed by faculty from the Jones College of Business at MTSU. The other core class, covering applied statistics and probability, is taught by the MTSU Department of Mathematics faculty. This strong business core equips

students to be business-savvy STEM professionals and to quickly move into management positions in their careers.

The Engineering Management concentration was started in late 2013 to provide Middle Tennessee's booming manufacturing sector with professionals with education in both engineering improvement processes (like project management and Six Sigma) and in management. Since that time, it has grown to a current enrollment of 19 students and has graduated 22 students. Like the other MSPS concentrations, all Engineering Management students must complete an internship instead of a thesis. The internships have been hugely successful for both the students and the employers, as discussed below.

Internship Class

Part of the MSPS Business Core (which all MSPS students are required to take, not just Engineering Management students) is the Internship course. This 3-credit course is available only to students who have completed a majority of their studies, usually in their last or second-to-last semester. Students, with the help of the MSPS Graduate Coordinator, are responsible for finding and securing their internship. Once approved by their faculty advisor and the internship class instructor (a faculty member of the Jones College of Business), the student can enroll in the class. The requirements for the internship is that it be at least 250-hours long, the project must involve both their science or engineering education and their business skills, and the internship must begin and end around the same time as the semester. These criteria help guarantee that the students engage in impactful, career-building internships. The class requires weekly journal submissions, reports, feedback from both the intern and the intern's manager, and a final 10-minute presentation at the end of the semester. Because of these internship and class requirements, the internship meets current Department of Labor internship guideline suggestions, and the internships can be paid or unpaid (although almost all are paid).[2]

Internship placement has traditionally been a persistent issue for PSM programs across the country. Consistent placement is needed to maintain desired graduation rates, and good placement is of great benefit to the student's career development and future employment. While finding and securing an internship is ultimately the student's responsibility, the MSPS program has significantly helped this process by hiring a Graduate Coordinator, who

- reaches out to local industry to provide more opportunities for MSPS internships;
- coaches students looking for their internship on how to uncover opportunities, network, and update resumes to match position openings; and
- acts as a single point-of-contact for businesses who are looking for interns.

An additional way the MSPS program has found to help connect its students to industry and to build strong partnerships with local companies is through leveraging the MSPS Advisory Board. The Graduate Coordinator collects the resumes of students looking for an internship for the next semester and then sends them to advisory board members to review. Board members can then contact the student if they have a project that they think would be ideal for a student, or may decide to open up several internship positions based on the strength of the candidates. Some of

the MSPS Advisory Board members are alumni, and so understand how useful and beneficial providing these internship are for both the student and the company.

Over 70% of MSPS are offered full-time positions by their internship employers[3], which shows that employers are significantly impressed with the knowledge and professionalism of these diverse, talented students (Figure 1).

Figure 1. Engineering Management students after completing their internship presentation in Spring 2018.

Engineering Management students have been particularly successful in securing career-starting internships at major regional manufacturing plants (Figure 2).

Calsonic Kansei	Nissan, USA
Feintool	Schneider Electric
General Mills	Siemens Medical
Jonstens, Inc.	Solutions, USA

Figure 2. Companies where students have completed Engineering Management internships.

Advisory Board

The MSPS Advisory Board was established at the same time as the MSPS Program to help guide and support its development. Since that time, as the program and its concentrations have grown, so has the roles of the board. The current mission statement for the board is as follows:

> *The MSPS Advisory Board is the liaison designed to bridge the gap between education and industry by working with MTSU to make recommendations regarding strategies to promote and expand the MSPS program.*
>
> *The overall goals of the MSPS Advisory Board are as follows:*

- *To develop and maintain lasting partnerships among industry leaders*
- *To work with vendors in securing donated lab equipment*
- *To obtain and secure regular internship positions*
- *To aid in post-graduate career placement*
- *To expand the MSPS fundraising network*

The MSPS Advisory Board consists of 56 members of companies and institutions, as well as members from MTSU faculty. Eight board members are associated with the Engineering Management program, including a graduate of the program. Once a year, the board meets to go over our current curricula to ensure that our students are getting the most relevant and in-demand skills and training needed by regional and national employers.

For example, at the 2018 MSPS Advisory Board meeting, the board discussed the importance of our students to develop basic programming skills. For each MSPS concentration, the board discussed what programs would be useful for students to learn to prepare them for the data work in their internships and careers. The board came to the conclusion that learning the statistical programming language R in the required core statistics course would benefit all students and provide the necessary skills and background to easily pick up other programming languages. This change in curriculum will begin in the fall of 2018.

Conclusion

In order to prepare STEM graduate students interested in pursuing industry careers rather than academic and research careers, the Council of Graduate studies recently recommended that graduate programs create expanded partnerships with employers to better the professional development needed by these students.[4] PSM degree programs are ideally suited to meet this growing need, as they focus on developing STEM and business management skills in students.

The MSPS Advisory Board is a great example of how such expanded partnerships can benefit both students and the employers. By helping place our students into internships, the advisory board ensures that we can provide our students with the practical experience they will need to start a successful career. The employers get the added benefit of being able to recruit top talent from our MSPS programs. Additionally, by helping the MSPS program review its curricula and provide input on the performance and skills of the internship students, the advisory board members keep our programs agile and on the leading edge of current industry trends.

As manufacturing in middle Tennessee grows, so too will the need for Engineering Management professionals. The MSPS Engineering Management concentration will be able to meet this local and national need by leveraging the expertise of its advisory board to provide the best education and best internships for its students.

References

[1] “Professional Science Master’s Affiliations” [Online] Available: https://www.professionalsciencemasters.org/sites/default/files/psmaffiliationflyer_part2.pdf [Accessed February 1, 2018].

[2] "Fact Sheet #71: Internship Programs Under The Fair Labor Standards Act" [Online] Available: https://www.dol.gov/whd/regs/compliance/whdfs71.htm [Accessed July 17, 2018].

[3] S. Foroudastan. "Middle Tennessee State University Master of Science in Professional Science Graduate Program Review," 2015.

[4] D. Denecke, K. Feaster, and K. Stone. "Professional Development: Shaping Effective Programs for STEM Graduate Students." Council of Graduate Studies, 2017. [Online] Available: http://cgsnet.org/ckfinder/userfiles/files/CGS_ProfDev_STEMGrads16_web.pdf . [Accessed February 1, 2018].

Bibliography

Dr. Saeed Foroudastan is the Associate Dean for the College of Basic and Applied Sciences (CBAS). The CBAS oversees 10 departments at Middle Tennessee State University. He is also the current Director for the Masters of Science in Professional Science program and a professor of engineering and engineering technology at MTSU. Foroudastan received his B.S. in civil engineering, his M.S. in civil engineering, and his Ph.D. in mechanical engineering from Tennessee Technological University. Additionally, he has six years of industrial experience as a Senior Engineer and 20 years of academic experience as a professor, Associate Professor, and Assistant Professor. Foroudastan's academic experience includes teaching at Tennessee Technological University and Middle Tennessee State University in the areas of civil engineering, mechanical engineering, and engineering technology. He has actively advised undergraduate and graduate students, alumni, and minority students in academics and career guidance. Foroudastan has also served as Faculty Advisor for SAE, Mechanical Engineering Technology, Pre-engineering, ASME, Experimental Vehicles Program (EVP), and Tau Alpha Pi Honors Society. In addition to Foroudastan's teaching experience, he also has performed extensive research and published numerous technical papers. He has secured more than $2 million in the form of both internal and external grants and research funding. Foroudastan is the faculty advisor, coordinator, and primary fundraiser for EVP teams entering national research project competitions such as the Formula SAE Collegiate Competition, the Baja SAE Race, the Great Moonbuggy Race, and the Solar Boat Collegiate Competition. For his concern for and dedication to his students, Foroudastan received MTSU awards such as the 2002-03 Outstanding Teaching Award, the 2005-06 Outstanding Public Service Award, and the 2007 and 2018 Faculty Advisor of the Year Award. He received the Excellence in Engineering Education Award and Faculty Advisor Award from the Society of Automotive Engineers (SAE). He received two Academic Excellence awards from the Tennessee Board of Region in 2010-11. Foroudastan has also won many College of Basic and Applied Science awards. In addition to this, Foroudastan also reviews papers for journals and conference proceedings of ASEE, ASEE-SE, and ASME, and he has been a session moderator for several professional conferences.

CAREY SNOWDEN serves as the Graduate Coordinator for the Master of Science in Professional Science program at MTSU. His duties include helping students secure internships, recruiting students, and coordinating the MSPS advisory board. Mr. Snowden received his B.S. in Biology from the University of Alabama and an M.S. in Genetics from the University of North Carolina at Chapel Hill.