Building and Sustaining a Successful Graduate Degree in Technology

Dr. Mohammad A. Zahraee, Purdue University Northwest (College of Technology)

Dr. Mohammad A. Zahraee is Professor of Mechanical Engineering Technology and Associate Dean for Graduate Studies in College of Technology at Purdue University Northwest. He holds Bachelor Degree in Mechanical Engineering from Southern Illinois University, MS in Structural Engineering and PhD in Engineering Mechanics, both from University of Illinois at Chicago. Mohammad joined Purdue University Calumet in 1989 and was the Head of the Manufacturing Engineering Technologies and Supervision Department from 1996 through 2007. He was also acting head of Electrical and Computer Engineering Technology Department from 2000 through December 2006. Mohammad is currently PI and Co-PI, working on several NSF and one DOL grant, totaling over three and half million dollars. Zahraee served ABET from 1992 through 2010 as a program evaluator, commissioner (Accreditation Team Chair), as well as the Chair of the Engineering Technology accreditation commission of ABET during 2009-2010. He also served as a member of the ABET Board of Directors as a representative of American Society of Mechanical Engineers (ASME) until 2016. As the Associate Dean for Graduate Studies, Mohammad has been successful in making the MS in Technology program at Purdue University Northwest one of the largest in the U.S.

Dr. Niaz Latif, Purdue University Northwest

Dr. Niaz Latif is the Dean of the College of Technology at Purdue University Northwest (PNW). He has served for two years as the Dean of the Graduate School and additional two years as the Interim Associate Vice Chancellor for Research and Graduate Studies at PNW. He has been Principal Investigator for National Science Foundation grants and US Department of Labor grant. He oversaw more than eighty sponsored research/project grants with a value of more than $20 million. He have as authored/co-authored numerous refereed journal articles and peer reviewed conference proceedings articles. He is a commissioner of the ABET and also serves on the Board of Engineering Technology Division iunder American Society for Engineering Education. He is a fellow of the Academic Leadership Program under the Committee on Institutional Cooperation (CIC) of 10 Universities.

Building and Sustaining a Successful Graduate Degree Program in Technology

Abstract

A Master's degree program in technology that includes leadership and management component allows students to enhance their technical skills and knowledge, as well as help them develop new leadership and management skills. The Master of Science in Technology degree program was initiated and implemented at Purdue University Northwest in the year 2008. This relatively new program has graduated over 300 students in a short time, and enrolls over 150 students every semester.

Purdue University Northwest, with two campuses in Northwest Indiana, has had ABET accredited undergraduate Engineering Technology programs since the 70's, therefore, there was a large alumni base to start the new Master's program. The Master's program begun in 2008 with no additional faculty or administrative resources, and did not have any specific concentration. Currently, the MS degree program has six concentrations in various disciplines within engineering technology and offers three industry-based graduate certifications. In addition, a fixed plan of study with a technology leadership and management concentration is offered that is fully on-line. The program is housed at the College level and not at the academic department level. Most students enrolled in the program take a full load of 9 credit hours and the program graduates over 60 students per year. Over 95% of these graduates obtain employment within three months.

This paper discusses the strategies of initiating, implementing, and sustaining such graduate degree program in Technology with various concentrations. Further, a fiscal model for the operation of the program by maintaining the program quality, high enrollment, and high employment rate of graduates is also discussed.

Introduction

Purdue University Northwest started its new Master of Science in Technology degree program in 2008, and today after 9 years, has one of the largest enrollments for graduate programs in Technology in the nation[1]. The program has had over 350 graduates. Many of these graduates also received graduate certifications (about 110) as part their degree addressing the regional needs of the industry.

Including technical management to an MS in Technology program has been the distinguishing factor between Master of Science degrees in Technology and those in engineering programs. In a paper on graduate programs in Engineering Technology, the authors recommended that Engineering Technology programs consider and incorporate emerging sub-disciplines, as well as including technical management in the curriculum[2]. The Master of Science in Technology program at Purdue University Northwest has followed this suggestion. Faculty, through their industry contacts, place students in internships before graduation. Many of these students are then hired in the respective business or industry because of the internships. On their assessment report of a cohort-based Master's degree in Technology, Latif and Dyrenfurth[3] reported that the required directed project work enhanced student' knowledge and skills at their workplace and

also a large number of students reported career growth after graduation. In other studies, the authors emphasized on the value of Master's projects and internships, especially for those students with no or minimal industrial experience, in securing jobs and employment[4, 5]. At Purdue University Northwest, graduates of the Master's degree program have had similar experience. However, once the enrollment hit triple digit numbers, a "coursework only" option had to be introduced to address 1) the needs of those who were already working, 2) the limitation that the faculty number presents in such growth and 3) the needs of, and issues faced with, online students.

In this paper, the issues and strategies used to create, implement, and sustain the program are discussed. Such issues include: limitation of financial resources, flexibility of the program, and currency of the program to address the needs of industry, delivery modes, as well as recruitment to sustain high enrollment.

Initial Stages of the Program

The Master of Science in Technology program started in 2008 with primary areas in the seven disciplines offered within the three departments housed in the College of Technology. The curriculum, consisting of 33 credit hours, included three core courses (9 credit hours), three elective courses based on the student's interest (9 credit hours), a 3-credit hour directed project in two phases, and any four courses in one of the seven areas in which the college had undergraduate programs (called primary area)[3]. At the same time, to respond to the needs of industry, three post-graduate certificates, consisting of four (4) required courses, were also introduced. They were in the three areas of:

Database Integration Technology
Organizational Leadership and Supervision
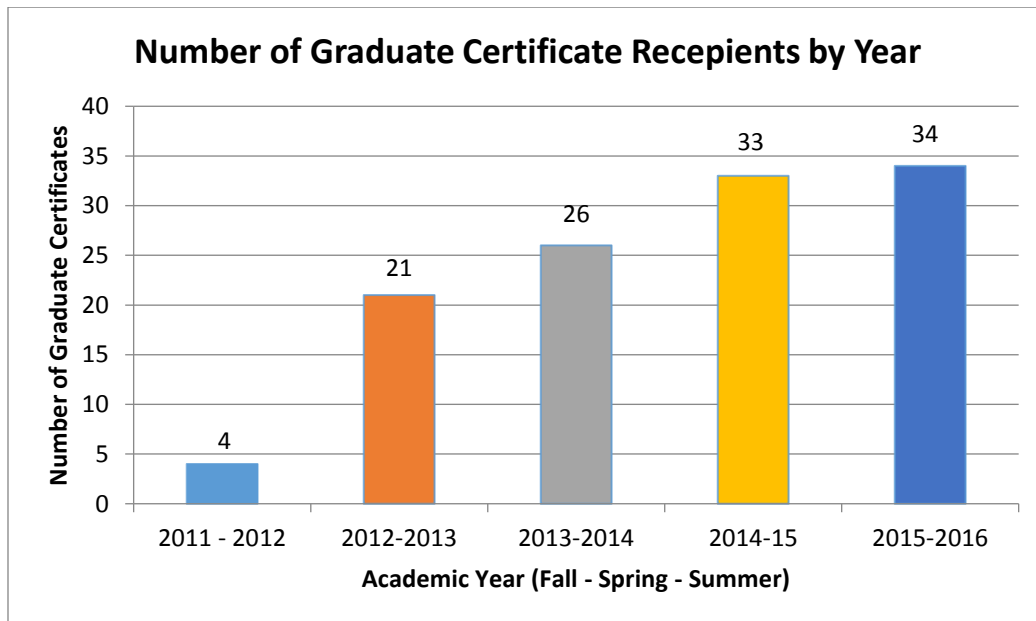Six Sigma for Business and industry

Figure 1. Number of graduate certificate recipients by year

These industry driven certificates served several purposes: 1) addressing the needs of regional industry, 2) the courses served as primary area courses for those who wanted to continue for their master's degree, and 3) set foundational courses for some of the concentrations that were introduced later once the critical enrollment mass was reached in those areas. The certificates have been received favorably by students and industry as shown by the number of certifications in the program (Fig.1).

Introducing Concentrations / Dealing with Enrollment Growth

The success of the program resulted in having 159 registered students by 2015. The 2016 enrollment is lower due to the large number of graduates in 2015. The enrollment growth of the program is shown in Figure 2 below. This enrollment number was more than three times the projected number in the proposal which was submitted to the Indiana Commission for Higher Education (ICHE). At that time the college had 34 full-time faculty members. This enrollment growth created opportunities, and at the same time some challenges, as mentioned later in this paper.

Since the number of students in some "primary areas" had reached a critical mass, the program introduced "concentrations" in those areas (Table 1), consisting of 4-5 prescribed courses, rather than any 4 courses in that area. This gave faculty the opportunity to define the requirement for the concentration which was printed on the student's transcript. Some areas, such as Electrical Engineering Technology, decided to concentrate on Energy courses, while others, such as Computer Information Technology, decided to have one concentration course in each of the four areas of expertise within the program.
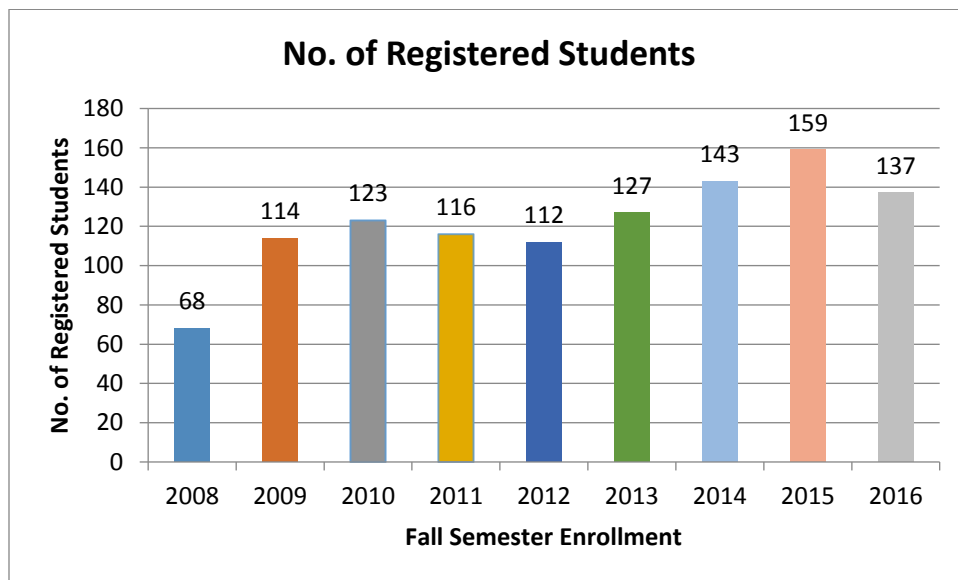

Figure 2. Enrollment growth based on number of registered students in Fall Semester

The first four concentrations introduced in 2012 were Mechanical Engineering Technology, Electrical Engineering Technology, Industrial Engineering Technology and Computer Information Technology. In 2013, a fifth concentration, Technology Leadership and Management, was introduced which has been offered as a fully on-line concentration in addition to in-class offering. This concentration, unlike the others, consisted of all prescribed courses. Later in 2015, a sixth concentration in Mechatronics Engineering Technology was introduced. This addition was the result of a successful undergraduate program which was introduced in 2009 and reached an enrollment of over 100 students by 2013. Table 1 shows the list of concentrations and the enrollment in each of those concentrations in fall 2016. Plans of Studies for each of these concentrations can be found in the following link: http://academics.pnw.edu/technology/graduate-programs/

Concentration	No. of Registered Students
Computer Information Technology	38
Electrical Engineering Technology	20
Industrial Engineering Technology	31
Mechanical Engineering Technology	15
Mechatronics Engineering Technology[*]	9
Technology Leadership and Management[**]	24

Table 1: Master of Science in Technology Concentrations and their enrollments

* Introduced in 2015
** Also available fully online

The enrollment growth, although favorable, introduced some challenges as well. The most important was the huge burden on faculty member's time. Having more than three student advisees with directed projects was imposing a tremendous amount of extra time on faculty. On the other hand, with an on-line concentration, it would be difficult, if not impossible, to conduct directed projects with minimum faculty interaction. The aforementioned factors contributed to the introduction of an MS in Technology with "Coursework only" option. This option started with replacing the "directed project" course with an elective for the on-line program, and shortly thereafter was changed to a 30-credit hour option, eliminating the "directed project" course or its elective course replacement. This option is very similar to the Professional Degree master's programs. Those who work full-time, typically opt for the coursework only option. Once this option was introduced, a lot of students chose this path resulting in a sudden increase in the number of graduates in 2012-2013, as shown in Figure 3. Students who have no previous work experience, or those hoping to continue for PhD, are recommended to take the "directed project" option. However, those who are offered a graduate assistantship are required to complete a directed project.

Sustaining the Quality and Enrollment of the Program

To sustain the quality of the program, a continuous feedback mechanism and assessment is in place. A survey of program alumni in 2013 showed that the outcomes and goals of the program

were met, however, those graduates who completed directed projects had indicated they benefited more through this project-based learning. Detailed assessments of this program are described in a paper by Latif and Colwell[5]. The directed projects have had a positive impact on regional and sometimes national, industry. A similar data collection of alumni in 2016 showed that a large number of them are hired by regional companies, resulting in the program having a positive impact on the economic development of the region.

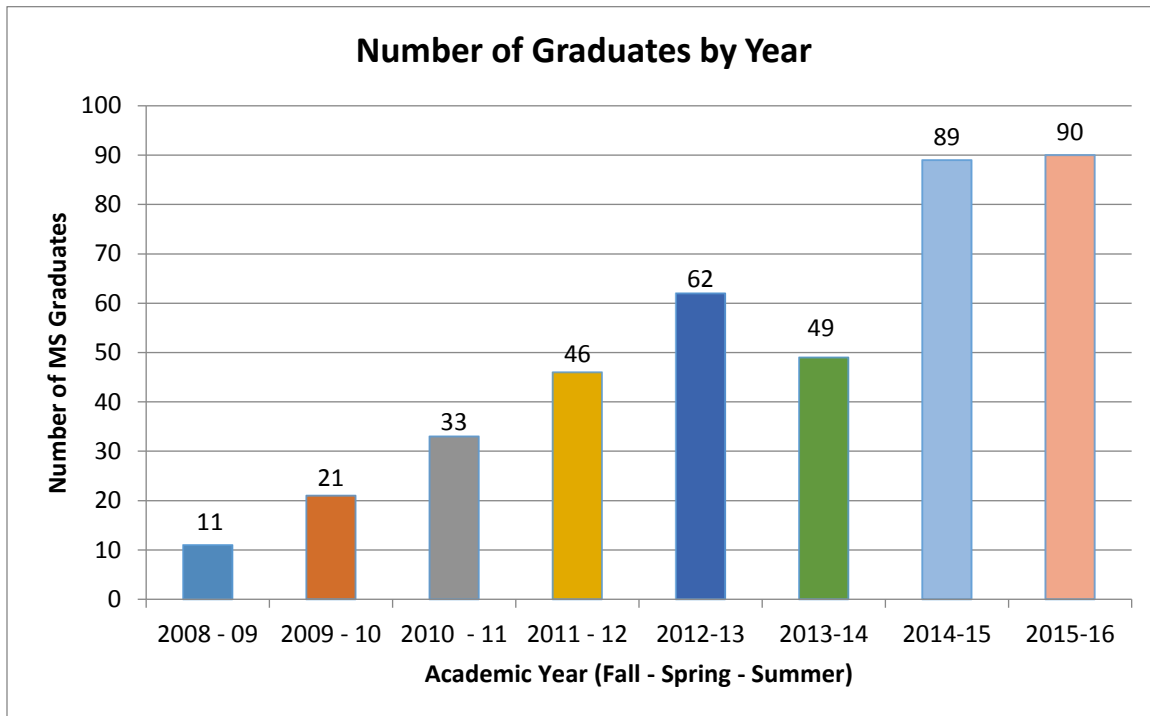**Number of Graduates by Year**

Figure 3. Number of Graduates per Academic Year

To sustain the growth of the program and have a stronger alumni base, an annual alumni event was introduced in 2015 and has been continued since then. Alumni from MS in Technology program are invited from all over the country and are updated on the progress of the program. It is a fun event to introduce some of our existing graduating students to our alumni and create an atmosphere of comradery among our graduates. Alumni are also surveyed at these events on how the MS program could be improved.

To improve the quality and sustain the relevancy of the Master's program, Graduate Studies Advisory Council was formed in early 2016 to visit the strategic plan of the program, to help the program grow, and to advise on relevancy of the curriculum. The Council, consisting of ten (10) members has been extremely active, has already set a five year strategic plan for the program, and is actively helping with student recruitment.

Quality Assurance and Fiscal Model

Due to the large number of students who graduate every year (Figure 3), to maintain the enrollment numbers, a large pool of applicants is needed. Having a robust and comprehensive marketing plan is the most critical challenge posed to a successful, growing degree. It requires both effort and financial resources. The program decided to run the fully online Master's program through the office of Academic Outreach and Contract Training (AOCT). This has helped to ease the financial challenge as some residuals from the revenue support the activities of the College of Technology Graduate Studies.

While marketing the program to get the large number of applicants is a large task, needs of constituents and keeping the program up to date should never be forgotten. That is why having an active and involved advisory council is crucial to continued success of the program. The members advise on the needs of industry by helping in the environmental scan, help set the strategic plan, fund raising, provide internships and employment to students and graduates, and last but not least, help with recruitment of new students.

While sustaining a large enrollment and having an enrollment growth is a challenge, maintaining the quality of the program is important as employers will continue recruiting from a program whose graduates are of high caliber and can perform on the job. Faculty play an important role in quality of the program and its delivery. Having qualified, full-time faculty is crucial and goes hand-in-hand with the quality of the program. The College of Technology at Purdue University Northwest has limited the number of limited-term lecturers in the graduate program and has hired a maximum of two part-time faculty in any given semester to teach its graduate courses. These part-time faculty members have been vetted carefully and like all full-time faculty members, had to complete a one-semester mentorship program using "Quality Matters" principles to get certified for online teaching. To address the challenge related to the number of full-time faculty, the College requires every new faculty member to contribute to the graduate program by teaching at least one graduate course per year.

Conclusion

To start and maintain a successful graduate program in Technology, several factors need to be considered. An initial environmental scan will help the program to set a curriculum which addresses the need of prospective students and employers. The program needs to distinguish itself from an engineering graduate program by having courses on managerial/leadership skills as well as courses on decision making skills, in addition to technical courses, as part of the curriculum. A step-by-step approach in growth, by slowly expanding the program, will help the program flourish as the offering becomes broader and therefore addresses the needs of a broader constituency. The College of Technology at Purdue University Northwest understood that enrollment will increase as students find employment or see advancement in their current position. It took advantage of the faculty industrial contacts to provide internships to its students to increase their employability. This helped the reputation of the program as more and more students applied for the program.

While the program is growing, innovative approaches need to be employed to provide a sound financial strength for program. This helps with marketing the program and having a large pool of

applicants. The graduate program decided to run its online program through the office of AOCT, which allows revenue generation for the program. This enabled the program to provide assistantships (and therefore recruit high quality students), as well as have financial resources for further marketing the program.

As the growth occurs, the program should continuously assess the needs of its constituencies to ensure an up-to-date curriculum, addressing those needs. The Graduate Studies Advisory Council has been addressing this necessity. The council has developed a strategic plan and helped with recruitment of students and fund raising for the program.

The program have graduated a large number of alumni. A recent survey of alumni has indicated that offering a PhD program in Technology is a viable option. This has been included in the five-year strategic plan of the program and is being pursued by the program.

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