

The Development of an MSEM Program with a Close Tie to Industry

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Abstract

The University of North Carolina at Charlotte (UNCC) has started up a new Master's program in Engineering Management in Year 2000. It is a program designed to have close ties with industry, to meet student and industry needs, and to enhance Engineering Management (EMGT) education. With just over a year, faculty members have revised the program curriculum to further enhance program collaborations with industry. In this paper, the discussion will cover the philosophy of the curriculum development, the offering of some Engineering Management courses with the involvement of companies, and the issues involved in building ties with industries. The examples of course offerings with industry's involvement include an advanced project management course, an industrial and technology management seminar course, and a legal issues in engineering management course.

Introduction

The growth in the demand of Engineering and Technology Management education is evident by the study done by Kocaoglu¹. Same trend occurred in the fast growing Charlotte area. Because of the demand in this area, UNCC started a new M.S. in EMGT program to serve technical employees of Charlotte area industries in Fall 2000. The students/prospective students in the program are mostly full-time career individuals. They need a program that has a close tie with industry and can provide them with up-to-date real world problem solving and managerial knowledge and skills. To fulfill these needs, the faculty in this new EMGT graduate program continuously improves the curriculum and adds more real world components into the curriculum.

Reisman² and Abbott³ stated that student involvement in actual industrial practice while pursuing the degree is very critical to the success of EMGT education. Smith⁴ showed that problem solving skills, leadership, and teamwork ability is absolutely necessary for students to get a good job. Tetzeli⁵ emphasized the importance of real world experiences in teaching students the "soft skills" in a corporate environment. At UNCC, the purpose of adding more industrial components to the EMGT curriculum is to broaden EMGT students' view on management issues from different perspectives, to increase their interactions with leaders from various industries, and to pave their path to senior management positions.

This paper demonstrates the curriculum improvement process through the discussion of the original curriculum offered in the first year and the current curriculum. Three of the core courses are the center of the discussion in this paper. Collaborations with industry in these courses reveal the philosophy for program curriculum development and improvement. The current curriculum is the result of the early stage improvement process and is subjected to further improvement.

Program Objective

The Master of Science in Engineering Management (MSEM) program at UNCC intends to provide the employees of fast growing industry and business community in Charlotte area an advanced technical management graduate program. It is an interdisciplinary graduate program designed for technical professionals who seek:

- Preparation for a career path in management
- A technical alternative to the MBA
- Managerial competence in technological operations

Therefore the program objective is to offer engineers, scientists, and engineering and business managers the state-of-the-art engineering management knowledge and techniques so they can efficiently and effectively manage engineering and technology systems and companies and be the future leaders in their industries.

Program Philosophy

The EMGT program grew from a commitment to creation of a top-notch hands-on program with close connections to industry. Its curriculum provides students with flexibility in their pursuit of the Masters degree so they can tailor their study plan according to their needs and interest. Meanwhile, the program wants to ensure the quality of its graduates with excellent technical, managerial, communication, and people skills in managing technical operations. Program faculty constantly evaluates and improves the curriculum with input from industry to meet the needs of Charlotte area companies.

The Original Curriculum

The original curriculum includes two options: (1) 24 semester-hours of coursework along with 6 hours of thesis research, and (2) 30 semester-hours of coursework. Both options include the following 6 core courses plus four elective courses for non-thesis option or two elective courses for thesis option.

- EMGT 6142 Quality and Manufacturing Management (3)
- EMGT 6901 Advanced Project Management (3)
- MBAD 6141 Operations Management (3)
- MBAD 6161 Organizational Leadership and Behavior (3)
- MBAD 6164 Executive Communications (3)
- MBAD 6195 Strategic Management of Technology (3)

EMGT faculty has revised the curriculum in less than a year to provide students more interactions with industry, more flexibility in course selection, more education as well as training in managerial and people skills, and more hands-on problem solving along with project handling experience in industry.

The Revised Curriculum

The revised curriculum includes a major change in core course requirement. Students need to take a seminar course for three semesters under the new requirement. Other changes include taking three EMGT courses from a list of eight courses and two MBA courses from a list of four MBA courses.

The following list summarizes the required coursework in the new curriculum.

1. Take EMGT 6980 Industrial and Technology Management Seminars (1) three times.

2. Take three courses from the following EMGT courses.

EMGT6142 Quality and Manufacturing Management (3)

EMGT6901 Advanced Project Management (3)

EMGT6902 Legal Issues in Engineering Management (3)

EMGT6904 Product and Process Design (3)

EMGT6906 Processing Systems Simulation (3)

EMGT6950 Engineering Systems Integration (3)

EMGT6955 Systems Reliability Engineering (3)

EMGT6985 Engineering Management Project (3)

3. Take two courses from the following MBA courses.

MBAD6141 Operations Management (3)

MBAD6161 Organizational Leadership and Behavior I (3)

MBAD6164 Executive Communications (3)

MBAD6195 Strategic Management of Technology (3)

4. Take four interdisciplinary elective courses (for non-thesis option) or two elective courses (for thesis option).

This new core course arrangement presents student more flexibility in course selection. If a student takes EMGT6985 Engineering Management Project, s/he needs to work on an industrial project in a company under the supervision of a committee that consists of an industrial advisor in the company, a faculty advisor, and a faculty committee member. This course provides students an opportunity to work on a real-world industrial project if they do not want to work on a two-semester thesis research but want to gain more project management and handling experience.

Course Examples with Industry Ties

Engineering Management is a broad discipline that deals with various technical and management issues. One approach to have students exposed to a variety of issues is to have them involved in some of the issues while working on projects. The other approach is to invite leaders in industries to share their experiences with the students. The following three EMGT courses use these two approaches to provide students interactions with Charlotte area industries.

1. The Seminar Course

The first example course is EMGT 6980 Industrial and Technology Management Seminars. This one-hour seminar course started in Fall 2001. EMGT students need to take this course three times for their graduate study. This course offers six to eight seminars per semester and covers current management issues, challenges, and practices in various sectors of industry. Seminar speakers come from manufacturing industry, business community, service industry, government agencies, and local government.

One purpose for this seminar course is to provide students the knowledge of current management practices in business, industry, and government agencies. The issues discussed in the seminar series include how to manage engineering and business systems and organizations, how to deal with people, organizations, and management related policies as well as problems, and how to adapt to the changing environment. The other purpose is to provide students networking opportunities by exchanging their thoughts with seminar speakers. One important aspect of this course is to let students see engineering management issues from different perspectives through these seminars.

This class requires students to write two-page reports for four of the seminars they attended. Each report contains a discussion of the key concept presented in the seminar, their thoughts and research of this key concept, and the potential use of this concept in their work. The following two seminar series illustrate the seminars given in Year 2001-2002. These seminar topics and the background of speakers cover a broad range of engineering management areas. The main point for this type of arrangement is to let students be familiar with the practices in different types of companies and to allow them to learn from other industries. The web site at http://www.coe.uncc.edu/mem/EMGT_Seminars.htm shows seminar speakers' background.

Fall 2001 Seminar Series:

- 1. Labor Planning and Management Issues in the Supermarket Industry**
By: Bill Rhyne, Director, Industrial Engineering, Harris Teeter, Inc.
- 2. Environmental Law and Policy for Engineering Managers**
By: Stanley Baker, Attorney at Law, Summa & Allen, P.A.
- 3. Engineering from a Business Perspective**
By: Ed Tucker, Director, Maintenance & Engineering, Philip Morris U.S.A.
- 4. Supply Chain Management in Dana Corporation**
By: Raymond Griffin, Supplier Quality Assurance Manager, WIX Filtration Products Division, Dana Corporation

5. **The Federal Reserve and the Economy --- Implications for U.S. Industry**
By: Dan Bechter, Senior Vice President and Officer in Charge, Charlotte Office, Federal Reserve Bank
6. **Intellectual Property Issues in High Tech Industry**
By: Charles Calkins, Attorney at Law, Kilpatrick Stockton LLP

Spring 2002 Seminar Series:

1. **Results Oriented Facility Maintenance Strategies**
By: Ray Thompson, General Manager, North Carolina Operations, and Kenneth P Hanshaw, Technical Sales Executive, Johnson Controls, Inc.
2. **Who Are You? And What You Must Be Prepared for in the Future Work Environment**
By: Fred E. Dabney II, President, *d2* Consulting, Consultant, Royal & SunAlliance, and Chairman, Charlotte Mayor's International Cabinet
3. **Process Improvement in Utility Industry**
By: Donald B. Blackmon, Vice President, Power Delivery, Duke Engineering and Services
4. **Where and When It Needs to Be: The Impact of Material Handling Logistics on Supply Chain Management**
By: Mike Ogle, Director, Technical and Engineering Services, Material Handling Industry of America
5. **Six Sigma at Danaher Tool Group**
By: Ed Gillespie, Tool Group Operations Quality Manager, Danaher Corporation
6. **Environmental Management System**
By: Eric Wu, Senior Environmental Engineer/Project Manager, URS Corporation
7. **22 Years at Three Start-up Companies -- Products, People, Planning, Growth, and Successes**
By: David Binkley, Associate Professor, ECE Department, UNCC and Cofounder and Consultant, Concorde Microsystems, Inc.

2. The Project Management Course

One required course that has a strong industrial tie is a project management course, EMGT6901 Advanced Project Management. Teng has sent his students to various companies to work on their projects in the past five years and generated good results for students and these companies^{6,7}. He is applying the same approach in this project management course at UNCC. Students in this class not only learn project management concepts, but also work on a real industrial project with their classmates. The objective of offering projects in the class is to teach students project handling, management, and implementation in an industrial/business environment through real project work. Students learn and understand the concerns of time, cost, people, culture, technology, feasibility analysis, improvement, teamwork and problem solving in a corporate environment. The purpose is to give the experience mentioned above in a real world setting.

The projects in the class are team projects and are done on-site in Charlotte area companies. Each project team consists of three to four members according to their preference. Most students

have the opportunity to work on a project at a company other than their own workplace. Each project team has two advisors, one faculty advisor and one industrial advisor to guide as well as monitor the project. Project advisors determine the final project grade based on their assessment of project results and student peer review results. Project teams need to present their proposal, project progress, and final project result accompanied with a written report for each presentation. Industrial advisors for all projects are present at each presentation. Therefore, inputs for the project work may come from other projects' industrial advisors and other teams. Students do peer reviews for their own project team members and for all teams' presentations after the completion of all presentations.

The following list exhibits the completed projects in the past two Fall semesters. Students in the class learned project handling and implementation from their own project and other projects. The web site at http://www.coe.uncc.edu/mem/project_a.htm shows the abstracts for these projects.

Fall 2000 Projects

1. **Cost Savings and Safety Enhancements of Glacial Acrylic Acid Storage and Delivery System at the Rohm and Haas Charlotte Plant**
Company: Rohm & Haas, Charlotte, North Carolina
2. **SAW v. SWP: Material Analysis and Cost Efficiency Study**
Company: Ceramco, Inc., Charlotte, North Carolina
3. **MFFF Digital Control System Vendors' Identification and Evaluation**
Company: Duke Cogema Stone & Webster, Charlotte, North Carolina
4. **Improving the Non-Conforming Materials Process**
Company: Manufacturer's Services Ltd., Charlotte, North Carolina

Fall 2001 Projects

1. **Data Collection and Analysis for the 7/16 Series Connector Use in Wireless Telecom Market**
Company: Kings Electronics Co., Inc., Rock Hill, South Carolina
2. **Fiber Optics Manufacturing Principles and Practices -- a Training and Development Program for Potential Employees of the Industry**
Company: Rowan-Cabarrus Community College, Salisbury, North Carolina
3. **Business Analysis for Future Profitability and Growth of Jenkins Electric Company**
Company: Jenkins Electric Company, Charlotte, North Carolina
4. **In Vessel Visual Inspection (IVVI) Tooling Concept Assessment**
Company: GE Nuclear Energy, Huntersville, North Carolina
5. **Due Diligence and Project Scheduling for a Proposed Municipal Solid Waste Landfill**
Company: Eagle Engineering Inc., Indian Trail, North Carolina

3. The Legal Issue Course

A third course, EMGT6902 Legal Issues in Engineering Management, reveals another type of interactions with industry for EMGT students. The goal of the course is to teach students the

basic legal issues that arise in engineering management. A topic list shown below presents that class sessions are focused on different legal topics. A pattern attorney with two engineering degrees teaches this course. The uniqueness of this course is not only because the instructor is a lawyer with strong engineering background, but also because he recruited twelve of his colleagues to teach some sessions of this course according to their expertise. Twelve attorneys from the same law firm and an Assistant District Attorney in a North Carolina county are the instructors of this engineering management legal issue course. The following list shows the topics covered in this course and the name(s) of their respective lecturers.

EMGT 6902 topics:

- Week 1. Introduction to the Class, American Legal System, and Legal issues faced by engineers [Gardner and Galyon (Assistant District Attorney)]
- Week 2. Patents [Gardner]
- Week 3. Trademarks/Copyrights, brands, etc.[Graham]
- Week 4. Contracts [Graham/Graves]
- Week 5. Employment [Culp]
- Week 6. Corporate Law [Prybylski]
- Week 7. Internet Law [Gardner]
- Week 8. Professional Liability/Engineer Liability [Walters]
- Week 9. OSHA/Occupational & Safety Rules/Regs [Doherty]
- Week 10. Litigation and Arbitration [Williams]
- Week 11. Taxation [Stout]
- Week 12. Construction Law [Stephens]
- Week 13. Products Liability [Boyles]
- Week 14. Environmental [Berlin]
- Week 15. Criminal Matters and the Corporation [Galyon]

This unique course arrangement attracts students from various disciplines and exposes students to many perspectives of legal concerns in engineering and management fields. Students taking this class learned from these lawyers as well as obtained networking opportunities through their contacts with industry. This course provides EMGT students another form of interactions with industry.

Conclusion

This paper discussed the approach for improving the curriculum of Engineering Management Graduate Program at UNCC. This program puts its emphasis on having a close tie with Charlotte area industries. The revised program curriculum adds more weight into industry-program interactions. The program has used different ways to enhance its collaborations with Charlotte area companies. The increased collaborations and interactions between the program, the students, and the industries benefit all parties involved, and improve the quality of Engineering Management education. Currently, the program is pursuing more opportunity to collaborate with area companies. The responses from local industries are extremely positive.

While pursuing connections with local industry leaders, the program faculty also works on the improvement of the current curriculum. Even though program faculty members currently encourage students to take cost and money related courses in the MBA program, they have set course development in the systems and cost areas as one of the top priorities in the continuous improvement plan. Getting constant input from industry leaders for curriculum improvement and program development is an on-going process and also a major priority in the program development activities. The program is in the process of establishing an industrial advisory board to guide further program development and curriculum improvement.

The advantages of establishing a close tie to industry are well known to all EMGT educators. The potential burdens of this approach are more of a concern to some EMGT educators. The first concern is that it requires tremendous amount of efforts and time to establish the connections, to make the contacts, and to make arrangements for all these interactions. For example, it often requires two to three months to arrange an industry speaker to give a speech in the seminar course. Frequent communication between the faculty and the speaker is necessary to schedule and finalize the seminar time and topic and to obtain the speaker's short biographical information. This two to three month period mentioned above does not even include the time for searching a suitable seminar speaker with right background and interest. The second concern is the resource allocated to the activities in this approach. Since the process to build up relationships with companies is time consuming and tedious, faculty may want to spend their time on more productive activities if there is not enough incentive to support this approach. Faculty members have to be enthusiastic and energetic in pursuing collaboration with companies. They also need to be patient in the process because good relationships require time to build up. Even with these concerns, the benefits still far outweigh the difficulties in this approach. In conclusion, this approach is vital to the success of the EMGT program at UNCC and is very well received by the students, the companies, and the people involved in the process.

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