

Reaching Out To Engineering Management Students

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Abstract

This paper describes the Masters of Science in Engineering Management (MSEM) program at Florida International University (FIU). The MSEM program at FIU emphasizes a practical, systematic, and programmatic educational environment that will enable future managers of engineering and technology to become technically competent and business-practice oriented. Prior to its implementation, a survey of potential students at local industries was conducted to measure the demand of the Engineering Management program. A split result was found in the preferred way of delivering the proposed program: while 47.4% of the potential students prefer an in-campus education, the other 52.6% favor distance learning. As such, all the MSEM courses are delivered through asynchronous education (videotapes) in addition to the traditional synchronous education (classroom). At FIU, graduate students in MSEM gain knowledge through traditional engineering lectures, guest speakers' presentations, and through study and discussion of related cases and articles. The Case Study teaching methodology, which encourages students to learn from others, presents a challenge in terms of involving the asynchronous students. This paper presents some of the techniques used to overcome the challenges of delivering education through this medium. Some of the techniques presented include the implementation of the MSEM Decision Room and the use of Internet classrooms.

Engineering Management Program at FIU

The emphasis in many companies today is to re-engineer the company and reduce in middle management. In the past large companies typically were too bureaucratic and inflexible to respond to market conditions. Therefore, the current trend is for companies to become leaner and concentrate their mission on critical areas, while outsourcing their non-critical functions. This new management trend contrasts with the previous desire for vertically integrated companies. As a result, Companies are now organized in teams much like hospitals, where the leader of a team is not only a manager, but also a specialist in the medical field. Today, technologically oriented companies prefer to hire an engineer and provide him or her with the necessary skills to effectively manage. This trend greatly differs from the previous practice of hiring a manager who then is expected to learn the technical skills related to that job function^[1]. The MSEM program is directed towards an academic preparation of individuals who will remain working in a technological environment while advancing into management roles^[2]. Engineers usually want to pursue a career in management, due the to scarcity of competent technical managers. However, they often find that their technical skills are not enough for such positions. Therefore, this degree is specifically designed to provide engineers with the necessary skills to move in to managerial positions.

The Florida Engineering Education Delivery System (FEEDS) was organized in 1983 to provide graduate level education and training in engineering throughout Florida, particularly at business and industry sites. FEEDS is a consortium of all institutions which constitute the State University System (SUS) and operates under the aegis of a Chancellor's Memorandum. FEEDS

set operational policies under a State System Operations Committee and a Regional Advisory Committee, which also include industry representatives. During the 1995-96 academic year, FEEDS served over 3,500 students at 200 sites across the State of Florida^[3]. The MSEM program is currently being delivered in both a traditional (live classroom) and a nontraditional (FEEDS videotape) manner. All the courses are offered at the University Park campus. Consistent with other graduate engineering programs in the SUS, FEEDS delivers all MSEM courses through asynchronous education or videotapes.

Prior to its implementation, a survey of local industries was conducted by FIU to measure the demand of the Engineering Management program. A total of 220 survey forms were mailed out to local companies and government agencies in August 1995, of which 26 survey forms were returned and analyzed. Some interesting findings are highlighted here^[2]:

1. Out of 26 companies and government agencies who responded, 17 of them (65.4%) already had continuing education programs for their employees.
2. 19 companies (73.1%) expressed the need for the Engineering Management program.
3. A total of 93 students could initially participated in the program with their employers' support.
4. A split result was found in the preferred way of delivering the proposed program. While 47.4% of the potential students prefer to receive their education on campus, the other 52.6% favor distance learning, or FEEDS.

A Glance at the Engineering Management Program after One-year of Implementation

Since the Board of Regents approved the Engineering Management program in July 1996, the response to the program has been overwhelming. Currently, twenty-nine students have been fully admitted into this program, seventeen students were tentatively admitted due to pending GRE scores or confirmation of their bachelor degrees, while another fifteen students have initiated the admission process. The student head-counts have considerably exceeded the expectation outlined in the feasibility study. Of these students, 23% are female, 18% Asian, 13% Caucasian, 6% African American, and 63% are of Hispanic Origins. Most of the students (72%) received their bachelor degrees from FIU, while 8% from other institutions in the State University System (SUS), 2% of all graduates come from other Florida universities, and 11% from foreign institutions. The average age of the student body is about thirty-one years old. On average, the students have waited three and a half years after their previous degrees to pursue the Engineering Management program. As for the background of the students, 31% have degrees in Industrial Engineering, 31% in Civil Engineering, 22% in Electric Engineering, 7% in Mechanical Engineering, and 9% in other engineering fields. Noticeably, ten students pursued the Master of Science in Engineering Management as their second post-graduate degree.

As expected, the program serves students mainly from local industries and government agencies. More than 81% of the students are full-time employees, with 70% working for private industries and 11% for government agencies. Geographically, 87% of the students are from local areas (Dade County) and 13% from remote areas.

Teaching Methodologies in Engineering Management

The MSEM program emphasizes a practical, systematic, and programmatic educational environment so that future managers of engineering and technology will be technically

competent and business-practice oriented. The MSEM program at FIU College of Engineering consists of 36 credit hours as follows: a core consisting of 12 hours of Engineering Management, and 12 hours of Business Administration, 9 hours of electives in a particular area of engineering specialization, and the Capstone Project of 3 hours^[1]. Graduate students in Engineering Management gain knowledge through traditional engineering lectures, guest speakers' presentations, and through study of related cases and articles. Most courses also require completion of a short project. Finally, the Capstone Project serves to integrate the students' knowledge through applied research and development. Typically through the Capstone Project, students learn to respond well to challenges presented at the workplace. The Capstone Project requires about half of the time to develop a typical Masters Thesis.

Use of Case Studies in Engineering Management Education

The advantages of the Case method in education have been well-documented^[4]:

1. Cases describe actual business situations. In that respect, dealing with cases is very much like dealing with the problems managers encounter daily.
2. Cases help us learn how to ask the right questions. By defining the problems for which we seek solutions.
3. Cases help sharpen analytical skills by encouraging students to defend their arguments while developing an increased ability to think and reason rigorously.
4. Case discussions provide a medium for the exchange of ideas among students, concerning the lessons of their experience. Students come to bear observations and experiences, that can provide a vehicle for reassessing these lessons and to gain an increased measure of learning from them.

For example, the Advanced Industrial Information Systems course is a combination of traditional engineering lectures, Harvard Business School case studies presented through student teams, and reading of related current articles. Furthermore, a number of industry guest speakers make presentations to the students during the semester on a number of topics. Figure-1 is a sample syllabus for this course.

Asynchronous education lends itself well to employees who are required to work more than the traditional forty-hour week must travel regularly. In order for the students engaged in asynchronous education to benefit from the case method and group learning, appropriate software tools are required. For the aforementioned class, students were divided into groups that incorporated both synchronous (live) and asynchronous (FEEDS) students. Students were provided with phone numbers and e-mail addresses of their group counterparts, and were responsible of getting in touch with their co-members. Each group was responsible for 2 case presentations. The case topics were tied with the lecture topics. For example, the case on Chemical Bank, which illustrates a groupware application, was tied with the lecture on Group Support systems. In preparation for the class discussion, all the students were asked to submit a one-to-two page analysis of the case that answered a set of questions.

Tools to Enhance Asynchronous Education: the Nicenet Internet Classroom Assistant

The questions to guide the case discussion were posted in a web based discussion tool provided by Nicenet^[5]. Nicenet is a non-profit organization made up of Internet professionals who give their time to provide services to the Internet community. Nicenet supports the public availability

EIN 6117 Advanced Industrial Information Systems FALL 1997 Syllabus		
Instructor: Dr. Irma Becerra-Fernandez		
Book: Information Systems Management - Sprague & McNurlin Collection of HBS Case Studies on Information Systems		
Week	Topics	Chapter
1	IT Strategy	3
2	IS Planning	4
2	Lecture on Networking Technologies	
3	Lecture on Knowledge Management	
3	Distributed Systems	5
4	"Building the Telecommunication Highway"6	
4	Industry Speaker- Mr. Antonio Diaz, Manager Planning & Provision - BellSouth Information Systems and Reengineering	
5	Group 1-1 st Case Presentation: Mrs. Fields Cookies Industry Speaker- Ms. Jeniffer Johnson, CTP Knowledge Management Applications	
6	Managing Information Resources	7
7	Group 2-2 nd Case Presentation: SABRE	
8	Group 3-3 rd Case Presentation: Open Market	
8	Group 1-4 th Case Presentation: Praxis Managing IS Operations	8
9	The Evolving System Development Spectrum-9 ***Midterm Exam***	
10	Management Issues in Development Spectrum-10 The Expanding Universe of Computing	11
11	Supporting the Expanding Universe of Computing-12 Group 2-5 th Case Presentation: Frito-Lay Decision Support Systems and EIS	13
12	Group 3-6 th Case Presentation: Chemical Bank Group Support	14
13	Visit to the MSEM Decision Room: Use of K.net, Frito-Lay DSS, Chemical Bank Application Software	
14	Thanksgiving - No class	
15	The Growing Importance of Intelligent Systems-15 Guest Speaker: Data Warehousing	
16	*** Final Exam ***	

Figure 1: Sample Syllabus for the Advanced Industrial Information Systems Course and how to use the Nicenet Internet Classroom Assistant

Harvard Business School Cases: A number of questions to guide your analysis have been posted in **Nicenet** (see below), a web based discussion tool. This analysis counts as part of your homework grade. Also, I'll be monitoring your participation in the discussion topics in **Nicenet**.

Each case will be assigned to a student group for presentation on the scheduled date. Student groups will be assigned next week.

Title	Case Number
Mrs. Fields, Inc. 1977-1987	9-194-064
Rattling SABRE – New Ways to Compete on Info-90307	
Open Market, Inc. (A)	9-195-205
Praxis International	9-396-093
Frito-Lay, Inc.: A Strategic Transition	9-194-107
Chemical Bank: Tech Support for Cooperative Work-9-193-131	

Two important pieces of data:
<http://www.nicenet.org>
The class KEY which is s1819a68

I've decided to use a new and no charge discussion tool called Internet Classroom Assistant. It can work perfectly for our needs. Everyone adds messages to various discussion topics related to the case studies that will be discussed in our class. It is simple to use the discussion software. The web address is <http://www.nicenet.org> and the assigned class KEY for joining the discussion is *s1819a68*. Remember the key and remember the name and password you choose for yourself. Type the key in the box called *Class Key* and click on *Join the Class*. On future occasions you will only need to provide the name and password you choose to log-in. Once you enter **Nicenet**, click on *Class Conferencing* in the column on the left of the screen. Each Case Discussion is defined as a *Topic*. The assigned discussion questions that you must answer in your homework appear under each *Topic*. To contribute to a topic click on the *Topic Title*. Read the questions and messages under the title. Then click on *Reply to Topic*. I'd prefer you keep comments public, and do not reply to *Dr. Irma Becerra-Fernandez* (me). At the bottom of the screen you'll see the window with *Choose a Topic*. If you want to discuss a different topic, click in that window to see the topics. Highlight one and click on *View Conference*. This is an alternative to returning to the original listing of topics. If you need to see the deadlines for presenting each case, click on *Schedule* in the column on the left of the screen. To see a list of important Internet links, click on *Link Sharing* in the column on the left of the screen.

- of the Internet Classroom Assistant (ICA), a sophisticated communication tool that brings powerful World-Wide-Web based conferencing, personal messaging, document sharing, scheduling and link/resource sharing to a variety of learning environments. Nicenet provides the ICA free of charge. The ICA runs on server space donated by The Searle Center for Teaching Excellence at Northwestern University and is powered by Allaire's™ Cold-Fusion^[6]. The ICA is designed for post-secondary and secondary classrooms, distance learning and collaborative academic projects. The ICA runs on Nicenet's server and requires only a regular web browser running on any platform and an Internet connection. Some of the features the ICA offers include:
1. Scheduling: Places the class schedule on-line.
 2. Document sharing: Students and professors have the ability to publish their documents on the site using simple web-based forms. No knowledge of HTML is required.
 3. Conferencing: Create your own news-group like, fully threaded conferencing on topics.
 4. Personal Messaging: Similar to traditional e-mail but fully integrated with document sharing and conferencing.
 5. Link Sharing: Share links to pertinent Internet resources sorted by topics that you create.

The big advantage of Nicenet ICA is that it's free and easy to use. The disadvantage is that, as any other web based tool, it can slow down as the Internet traffic increases. Also, students must be provided with incentives to use this tool. For example, the ICA can provide a means for students to express themselves, but they seldom use this tool despite its availability. Graded participation and use of the ICA to submit homeworks is one way to encourage its use.

Conclusions

In conclusion, the number of enrollments in the MSEM program has considerably exceeded the expectation outlined in the feasibility study, and the profile of the student body match closely with the projection. Engineering Management (EM) professors face unique challenges as they strive to enhance the learning experience of their asynchronous students. Groupware can be used to facilitate team projects in asynchronous environments. But groupware in itself is not a panacea, since adequate processes must be put in place to encourage its use and maximize its benefits. In addition, groupware tools used in EM programs must be easy to use and essentially have no learning curve to avoid further isolation of the asynchronous student. The ICA is designed to complement collaborative distance-learning environments. The ICA is an excellent tool to promote teamwork and collaboration through threaded topic discussions and asynchronous exchange of ideas. To ease the implementation of future asynchronous education, new and improved groupware tools like the ICA need to be developed, in order to reach out to the current and future Engineering Management student.

References

- [1] Becerra-Fernandez, T. Lee, J. Riedel. The Missing Link in Asynchronous Engineering Management Education, Proceedings of the Annual Conference of the American Society for Engineering Management, October 1997, Virginia Beach, Virginia.
- [2] Florida International University College of Engineering and Design, Department of Industrial and Systems Engineering, Request for Authorization to Implement the Master of Science in Engineering Management, proposal submitted to the State of Florida Board of Regents, March 1996.
- [3] FEEDS State System Operations Committee, 1995-96 Florida Engineering Education DS Annual Report, August 1996.
- [4] R. Corey. The Use of Cases in Management Education, Harvard Business School Publishing, Case Number 9-376-240, June 1995.
- [5] <http://www.nicenet.org>
- [6] Allaire™ Corporation, based in Cambridge, Mass., is a leading Internet software firm dedicated to creating Web development tools for corporations, universities, government agencies and Web presence providers worldwide. The company's products include Cold Fusion, HomeSite, and Forums.

Biography

IRMA BECERRA-FERNANDEZ is Assistant Professor of the Industrial and Systems Engineering Department at FIU and currently teaches in the Engineering Management Program. Dr. Becerra-Fernandez holds a Ph.D. in Electrical Engineering (EE) from FIU, and a Masters in EE from University of Miami. Dr. Becerra-Fernandez has over ten years of experience in Energy, Space Administration and Academia, in the areas of engineering management, information technology, technology transfer, competitive intelligence, and secure communications.

TED LEE is Chairman of the Industrial and Systems Engineering Department at FIU and is currently the coordinator for the MSEM program. Dr. Lee holds a Ph.D. in Industrial Engineering from Iowa State University. Dr. Lee has over ten years of teaching and research experience in automation, computer integrated manufacturing, and intelligent transportation systems design.

GORDON R. HOPKINS is Dean of the College of Engineering and Design at FIU. Dr. Hopkins holds a Ph.D. in Engineering Mechanics from the University of Alabama and a Masters in Mechanical Engineering from the

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