DEVELOPING A WORLD OF LEADERS THROUGH THE MASTERS OF BUSINESS AND ENGINEERING

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ABSTRACT

This paper discusses the early development of the Master of Business and Engineering (MBE) Degree in Construction Engineering Management at Oregon State University. The program is designed to develop industry leadership by focusing on enterprise-level topics, and by demonstrating the role of organizations as strategic forces—reacting to changing environments and providing resources for producing projects. Engineering and construction-related courses are combined with more traditional MBA courses in order to overlay theoretical business and management knowledge from the retail and manufacturing industries, onto the unique, service-based construction industry. The initial concept of the MBE is discussed, the structure of the program is presented, and reflections are made on four years of program history, which provide commentary and lessons-learned. Included among this early operating history are observations of the MBE’s impact on international graduates.

KEYWORDS: Graduate Education, Globalization, Enterprise Management.

INTRODUCTION

There are many programs that offer graduate degrees in construction engineering and construction management in the U.S., as a simple Google search easily affirms. The School of Civil and Construction Engineering (CCE) at Oregon State University (OSU) is one such program that offers traditional graduate programs leading to M.S. and Ph.D. degrees in Civil Engineering. For years, graduate students with interest in construction engineering management (CEM) at OSU would elect the M.S. in Civil Engineering and focus their major course work on engineering-based classes offered within CCE. As with most such programs, the focus of the M.S. coursework is within the confines of skills employers sought of project managers (Farooqui and Ahmed 2009).

In 2001, R. C. Wilson, a retired construction contractor, proposed an additional advanced degree in construction education at OSU; Wilson made the program possible through a sustaining donation. He believed that much of his success came from project management skills learned in college and business management skills that he learned “on the job”, over the course of many years in a trial-and-error fashion. His interest was to provide a program that would give young managers a more firm base from which to grow their careers and organizations; his endorsement reflected his life-long perspective of the need to combine business skills with engineering skills to be successful.

The purpose of the degree is to offer graduate-level CEM education, targeted at providing advanced enterprise-level management skills. This degree was designated as the Master of Business and Engineering (MBE) degree (Sillars and Rogge 2003) and it differs from the existing M.S. degree program in several ways. The MBE degree requires significantly more business course content and features several alternate means for degree completion: coursework plus an internship, coursework plus independent study, or all coursework. An additional

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important distinction is that the proposed degree will accept qualified candidates with any bachelors degree from an accredited program if the student has significant industry experience, whereas the current M.S. requires candidates to have a civil engineering or construction management degree.

The Master of Business and Engineering (MBE) in Construction Engineering Management (CEM) degree received approval and the effective date of program start was Fall, 2004. The MBE program also spawned four new classes, which began to receive students as early as Fall, 2003. Due to this earlier availability of the new, required coursework, one student began taking the required courses before the MBE received final approval. As a result, the MBE program had its first graduate present his oral defense and graduate in December, 2004.

Evidence of Need

The overall MBE program was developed to respond to industry need. Need was assessed through a survey of industry practitioners, including OSU and non-OSU graduates (n=90), as well as senior students in the CE and CEM programs at OSU (n=25).

58% indicated that it was very likely or somewhat likely that they would “…pursue an advanced degree at some time...” in their career.

68% of respondents in the survey indicated that they were interested in the possibility of obtaining a Master of Business and Engineering degree.

91% responded that the “possibility of retaining employment while completing degree requirements” is very important or somewhat important.

The surveys demonstrated a need for a CEM graduate degree structured in such a way that degree candidates were able to retain employment while completing their degree requirements. The program is structured to allow students commuting to Corvallis from as far away as Portland to complete the degree in two years, or for the resident student to complete in one year.

The construction industry has been steadily absorbing increasing numbers of construction managers over the last decade. To fill this large need, the industry is pro-actively recruiting workers and managers from all segments of society, including reaching those who have been traditionally under-represented—especially minority and female populations—who may not have followed a traditional undergraduate engineering path. The proposed program assists in establishing a larger workforce in at least two ways—first, the program provides an accessible middle- and upper-management entry point to those who may not have found other opportunity; second, the program provides an opportunity for those with non-engineering degrees who would otherwise be limited in industry growth, to obtain an advanced CEM degree and participate more fully in the industry.

PROGRAM DESIGN

The goal of the MBE program is to provide a master’s level graduate program that will prepare students for management-level construction engineering management careers in industry, regulatory agencies, consulting firms, and municipalities. Course work in support of this program is offered cooperatively by the Construction Engineering Management program and College of Business at OSU. The program was developed to allow current undergraduate students as well as working construction and engineering managers an opportunity to combine approximately equal content in graduate MBA business courses and CEM courses into a masters level degree program.
The program is designed to allow students to work towards their MBE degree while continuing employment with construction industry firms. Through an internship option, these individuals may give back to their employers by implementing academic concepts from their coursework in the workplace, measuring and analyzing the outcomes, and publishing the results. The advantage to the supporting employer is that implementation of academic concepts will be immediate, and CEM and College of Business faculty will interact more closely with their industry customers.

Due to the large interest shown in the survey for flexibility while working, the program was designed in a format that allows completion of degree requirements on a part time basis over two years or full time in one year. The two year completion format coordinates CEM offerings with MBA course offerings to allow working students commuting to Corvallis to make one trip a week, 33 weeks a year, for two years. An option for web-based distance education is currently being explored.

CURRICULUM OVERVIEW

The proposed curriculum combines courses from the Colleges of Business and Engineering as shown below. All students would be required to complete a minimum of 45 credits. Of these 45 credits, a minimum of 20 credits of CEM content and a minimum of 18 credits of MBA (College of Business) content would be required (Figure 1). The remaining seven credits could be CEM, business, or any course qualifying for graduate credit and approved by the supervising professor.

The 20 credits of CEM content may include internship credits, research project, and/or additional coursework—at the student’s discretion. The topic of the internship or research project is approved for its academic content and is monitored and assessed throughout its progress by the supervising professor.

The student’s required capstone activity depends on the academic experience option chosen: for internships, an internship report and presentation is required; for independent project research, a project report and presentation is required; for all-coursework, a portfolio of the coursework experience and a presentation on the synthesis of the concepts learned is required. In all cases, a final oral exam is given.
MBE-SPECIFIC COURSES

A total of four new CEM courses were developed to implement this program; these new courses are described below as required courses. These new CEM courses are available to all students within the School of Civil and Construction Engineering and have proven popular among that larger student base. In addition to these required CEM courses, a number of MBA courses are required as well, as described below:

Required CEM Coursework

Risk Management in Construction. This course develops in the student an understanding of the concept of risk; practical examples of risks associated with construction projects and businesses; methods for capturing, quantifying and analyzing such risks; and methods of mitigating these risks through contractual or managerial means (Sillars 2005).

Construction Business Management. This course introduces the students to concepts of business structuring; specific business structures associated with the construction industry; enterprise-level management techniques; ethical issues in construction business management; extra-organizational risk management; and operational management structuring.

Advanced Project Controls. This course provides graduate-level development of project control systems and management techniques used in modern construction project management. Topics include traditional and web-based communications; quality-control management; cost-tracking; time-based decisioning methods; and ethics in construction project management.

Innovation in Civil and Construction Engineering. Innovation concepts in construction and civil industry and enterprise management are introduced. Students develop potential innovative enterprises and model and evaluate those innovations, projecting market acceptance and timing.

Required MBA Coursework

Financial and Cost Analysis. Analysis of the balance sheet and income statement to determine profitability, risk, and rate of return; preparation of pro-forma financial statements; cost measurement for products, projects, jobs, customers, and markets; strategic cost decision making for pricing and resource allocation.

Financial Markets and Institutions. Study of five major financial markets: Stock, Bond, Futures, Options, and Currency. Topics include the history of each market, the agents involved in each market, the individual agent’s motives and behavior in the markets, the formal and informal rules in each market, and the nature of trading of assets in each market.

Information Management. Role of information technology and information systems in an organization. Topics address the strategic role of IT and contemporary business technologies. Projects will be assigned to illustrate the topics.

Building Customer Relationships. Understanding the strategic importance of understanding customers and their needs; includes examining the rationale as well as limits of the marketing concept, marketing planning, segmentation and positioning and the long-term value of customers. Learning about the customer is done through description of both qualitative and quantitative research methods.
STUDENT POPULATION

The proposed program has drawn new students to the institution. It is an attractive degree program because of the student’s need for education to move into middle and upper management and because many prospective construction industry managers are working with non-engineering degrees but need more formal CEM education to advance. The elimination of the requirement of a CEM degree for admission has allowed many individuals to pursue the MBE degree with their professional construction industry experience; in those cases, the entering non-civil and non-CEM degrees have included architecture, mechanical and electrical engineering, physics, and other degrees.

This program has served both on-campus and commuter students. The initial CEM offerings are coordinated with existing OSU evening MBA offerings. Each term the OSU CEM program offers an evening section of a required course. CEM offerings are coordinated with the afternoon offerings of the required MBA courses; therefore, only one attendance per week per CEM class will be required. This has allowed students from the Oregon cities of Eugene, Bend, Salem and Portland to take the program courses.

The program has served a total of 27 students to date; of those, 22% have been foreign students (Figure 2). The countries represented have included Afghanistan, Argentina, India, Ghana, and Korea.

![Figure 2 - Nationality of MBE Students](image)

THE GLOBAL IMPACT

Globally, the MBE degree has developed students who are better armed at providing construction engineering and management services worldwide. The Argentinean student is currently working in France for one of Europe’s largest design-build firms. The Korean student has returned to Korea and is working as a senior project manager for a Korean design and construction firm. The Afghani student has recently returned to Afghanistan. He writes [unedited]:

“…like any other aspect of life in Afghanistan, the construction industry is also much different and challenging than normal countries. During the short time after return from US and being involved with construction activities, in my opinion, some of the challenges that the construction industry is faced in Afghanistan are: Unfair bidding process…Unskilled
labor…Poor government regulations and procedures, and High uncertainty about promises and contractual agreements.

“My education [is a] valuable asset that I always carry with me… It is not easy to change the culture of construction industry in Afghanistan…it is possible to implement what you have learned on project basis. I could use some of the concepts that I learned at OSU in order to overcome a number of challenges that I faced as Project Manager, For example…I could convince my boss about the importance of workers' safety on a project…I changed the organizational culture within my project from a military style of management to a traditional one…I could introduce a standard type of construction contracting procedures and in some [extent] I implement it. This could reduce the risk of sub-contractor/supplier irresponsible performance…I was able to perform capacity building trainings for the project team…the concept of Risk management, which I learned at OSU helped me to perform basic risk analysis for the project. This helped to reduce unexpected events during the construction phase. Specially, in reduction of security risk and possiblity of a military attack.”

Other current international students explore their impact on the global construction picture through development of such studies as creating a business for consultancy to establish local/international partnerships in developing countries; as researching the tendency for organizations such as the World Bank to contract mostly with large global constructors rather than in-country firms; and as theorizing methods to use country financial risk indices in making profit decisions in international public/private partnership deals.

ON-LINE COURSEWORK DEVELOPMENT

To respond to expected demand, some work has occurred to extend the program to national and international markets through distance education. In an effort to ensure continued program quality, a survey of current MBE students (n=14) was conducted to expose potential issues, revealing varied feelings about an on-line option. Among the issues voiced were:

**Pros**
- Would allow for flexibility, in terms of when a student must attend the course;
- Would be significantly easier for working students;
- May allow more distant/foreign students to attend; and
- An on-line course could be used as a make-up for a missed traditional course (assuming that both are held concurrently).

**Cons**
- Classroom interaction would be missed—both student/professor and student/student; when the use of “chat rooms” was offered as a solution, there was skepticism that chat rooms would be a replacement for face-to-face contact;
- May require more “off-time” from professors; i.e., if students need answers from professors at any time, then professors must adjust schedules to be available on-line at all times; and
- May result in significantly reduced instruction, due to the need to “standardize” the instruction—this comment was offered by a student who had taken several on-line courses.

These issues are among the many that are being balanced in attempts to broaden the geography across which the MBE may be offered.
OBSERVATIONS AND NEXT STEPS

Strong interest continues to be expressed; contact from prospective students occurs from email (generated by University website hits) and from personal conversations with undergraduate students, especially seniors. There appears to be an equal split between students entering the program from industry and those entering directly from their undergraduate experience at OSU.

While the program has offered three curricular options for students—internship, independent project research, or all coursework, to date no student has elected to undertake an internship. Anecdotally, it appears there is only mild interest among employers to engage in a formalized, academic study of internal problems.

The graduates have often received employment opportunities with entry levels that exceed those for undergraduate employees. It appears that these students are able to function well in early middle-management positions, which is the target of this educational experience. It’s a little early to draw generalized conclusions, however.

This program is increasing in enrollment, and has turned out to be an excellent means for some students to develop a new entry point for their careers. One of the initial concepts of the program was to accept students who have significant industry experience but without an engineering degree. Several students have taken advantage of this opportunity, and have (or will) complete the program and enter into project management and early mid-management positions in the Construction Engineering Management field.

To gauge student satisfaction, a survey of existing and former students was conducted early in the program (n=10). A brief summary of the results is as follows:

- **Indicate overall satisfaction with the program:** (1 = unsatisfied; 10 = extremely satisfied). Result—average of 7.7.
- **Rate the quality of the required engineering courses:** (1 = poor experience; 10 = exceptional experience): Result—average of 8.0.
- **Rate the quality of the required business courses:** (1 = poor experience; 10 = exceptional experience): Result—average of 7.4.

CONCLUSION

Graduates of the MBE program have completed (and will complete) a relatively unique program of study, combining business and construction engineering management:

- Graduates have an improved understanding of the links between construction engineering management and business and will form working networks to advance U.S. and international industry;
- Graduates working with formal education in construction management and business have and will obtain additional structured, formal education relevant to executing construction projects and operating construction companies; and
- Graduates currently working in the construction industry without formal education in construction management and business have and will obtain a structured, formal education relevant to executing construction projects and operating construction companies.

The MBE program presents an opportunity for the Colleges of Engineering and Business to collaborate on graduate level construction and business management, exposing students to a set of skills that will provide them with a sustainable career.
Operating experience is positive and reports from employed students indicate a relatively rapid rate of career advancement, although formal statistics are as yet developed. Several students have carried their experiences internationally and are employed in positions in which their education may be used to improve their workplace.

The MBE program continues to develop and its course offerings are continually adjusted to meet the needs of employers and to develop managers of the future. An on-line option is cautiously being explored.

REFERENCES

