

A New Model of Professional Education: The Development and Implementation of the On-Line Synchronous Master of Construction Management (MCM) Program

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Graduate Education has emerged as an important addition to the construction management field. With unique conditions, industry demands and ability to participate in a MCM programs, employees are requesting additional education in the new areas of construction management and design. Because of limitations of current traditional resident required learning, professionals have been unable to attend. Realizing this need, the East Carolina University Department of Construction Management established the first On-line synchronous Master of Construction Management (MCM) program. Development of the program looked at industry's concern for availability and the technological capabilities of such an educational model. This paper explains the need for, the development of, and the implementation of the On-line synchronous MCM program. Program growth, success, challenges, and future development are discussed.

Key Words: Masters; On-Line; Non-Traditional Students

Introduction

The creation of a Master of Construction Management (MCM) degree is not a new concept. However, the delivery of that graduate degree program was based on the premise of reasonable expectations of a working professional (Mulligan & Knutson, 2004) to participate in a learning environment was the paramount decision in the development of the program. Construction management faculty, working in conjunction with industry input and advice created the program. Realizing that the traditional Masters Degree model was well established in other programs, East Carolina University (ECU) Department of Construction Management determined that a more relevant new direction was imperative to allow the program to reach a new level of previously unrepresented individuals within the construction industry.

Through on-going discussions with our Advisory Council members, industry members and alumni, their constant complaint was that employees did not have the time or ability to return to a campus setting for weekly classes. The traditional model did not work for the employed construction manager. Since 2005, our Advisory Board reviewed, discussed, and endorsed a new model MCM degree. Not only would this degree assist their employees, it also created an opportunity for those individuals interested in moving into the academic environment. Nationally construction management programs are looking for approximately sixty new faculty members to fill existing or new faculty positions. All university and some community college programs require the masters as the minimum level of educational preparation to be a faculty member. This MCM degree is positioned to prepare some of the future construction educators, individuals with extensive practical knowledge ready to give back to the field of industry that has given them so much.

Based on this unique condition of the construction profession, a concerted effort was made to create a new more viable model for graduate education that allowed working professionals to gain advanced education in a manner fitting to their working conditions. It was our decision to develop an on-line synchronous, industry driven need, Masters Program. This decision led to in-depth research by ECU faculty members to develop the most vibrant learning environment available that would not tax university or student participant cost and sophisticated technological knowledge. The research assisted in the development of the current on-line degree program.

Background

In the development of the MCM program, two major decisions directed the development of the university proposal and class structure and content. First, the program would be administered entirely on-line to insure that students, no matter where they were physically located, would be able to attend and participate in our graduate program. The second criterion was that this model would be directed towards working professionals with management experience.

From the outset the MCM program was determined to be offered via the Internet to meet the needs of the working professional. Professional constructors have indicated a face to face program offered on a college campus is impossible for them to participate in. Constructors frequently have site activities, planned and unplanned, that extends well beyond the normal working day. In addition, individuals move from one construction site to another as part of their employment often creating a prohibitive travel distance to campus. These same individuals have access to computers on site and are knowledgeable in their use. Our college had the server capacity in place to initiate and operate this program. The university infrastructure has the latest in broad band Internet, voice and video over IP, teleconferencing capabilities, and campus wide utility shell programs.

The 30 CH non-thesis MCM program was designed to bring practicing construction managers to a new level in the use of construction related managerial tools, concepts, and processes. (See Table 1) Graduates from BS programs in construction management have learned fundamental aspects of these construction related managerial tools, concepts, and processes. The MCM degree allows those professionals to move to a new level of proficiency and productivity. The program also provides the opportunity for practicing construction management personnel with extensive industry experience that hold college degrees related or unrelated to construction the opportunity to enhance their professional standing in the profession.

Table 1
MCM Course Descriptions (ECU Graduate Catalog, 2008-09)

Critical Analysis and Evaluation of Construction Documentation: Methods of critically analyzing project data associated with construction design, process application, and project control problems and formulating logical solutions through a variety of documentation sources.

Advanced Computer Applications in Construction: Understanding of emerging computing and information technologies in construction management and engineering.

Human Resources and Training: The study of Human Resources in construction business environments; the theories of human behavior and how it is influenced by leadership, organization, environment, motivation, and culture.

Advanced Applications in Construction Scheduling: Managing construction scheduling, project control, and strategic planning and analysis of single and multiple projects.

Land Use Management and Development: The course investigates the principles and practice of site planning and infrastructure design for large urban developments, with relevant aspects of land use theory and implications for site planning.

Global Management of Construction: Special problems and procedures related to international construction projects; impact of social, cultural, legal, and financial aspects of international contracting; logistics of labor, materials, and equipment in a foreign environment.

Quality Control Systems: Developing and implementing methods of controlling and evaluating quality control in all processes of construction.

Legal Implications of Design & Construction: Risk liability in the construction industry, contract case law, tort law, negligence, products liability, and the role of liability insurance and the professional liability of designers and building contractors.

Advanced Cost Estimating/Cost Analysis: Incorporation of emerging estimating and cost control measures in construction industry. Conceptual and definitive estimating, cost developing, cost analysis methods, project delivery implications, international work implications, international work implications, and computer applications and modeling.

Research Capstone Seminar: Capstone Project development. Provides graduate students in Construction Management an opportunity to conduct independent study and research for the Master's degree program.

Understanding that construction as a profession is undergoing dramatic changes with complex technology and computer applications entering the work place, new materials and processes, laws, cost containment, environmental and land use issues, quality systems, and human resource management, the MCM program was proposed to prepare personnel to prosper in this rapidly changing profession and as a result would have a significant impact on the economics of the region. Regional, national, and international economy is dependent on the construction profession as noted by six percent of the gross national product attributed to construction (U.S Bureau, 2002).

The construction industry has been challenged to meet its personnel shortages at all levels. Upper level construction management personnel are and will continue to be in high demand as the sophistication of construction rapidly changes to meet the demands of new technologies, processes, and equipment. Large numbers of management personnel that have grown up with the industry will be leaving the industry because of retirement or the inability to change with the industry. The MCM graduates will be elevated to the professional level needed to meet the challenges. They will be prepared to be the innovators, problem solvers, and leaders in the coming construction revolution.

Based on these desires and constraints, the authors began developing the methodology needed to accomplish synchronous on-line learning environments. Active learning is facilitated when students are engaged with the context of their education. An engaging process requires that learning be relevant, current, and interactive. Learning is improved when students play a larger role and invest themselves in the education process (Burke, 2005). The active learning environment is not only the responsibility of the student, but also the instructor, particularly with an interactive on-line teaching environment. Instructors must adopt methods that extend beyond conventional teaching. Flexibility, adaptability and preparation for unexpected situations is common in the on-line environment. On-line instruction is more demanding for connectivity to each student, and instructors must be prepared to change their intended approach if connections are not made, either because of technological failure or student disinterest or passivity (Connell & Batie, 2006).

A variety of approaches were investigated, including now traditional college web-meeting devices, such as Web CT and Blackboard, that allow live chat rooms, but are limited in their ability to create a dynamic synchronous environment. Further research investigated Click-to-Meet ® software that provided the synchronous class system we desired. However purchase costs were too great for the system desired. However during discussions with our University Computer Information System e-learning mentors, the CENTRA® Symposium web conferencing learning program was discovered, and ultimately chosen for implementation in the MCM program (Connell and Batie, 2006). CENTRA® Symposium provides a virtual classroom using live and recorded sessions and enables faculty and students to attend class "live" from anywhere they have access to an Internet connection. Access is made using a web browser and enables the student to see and hear the instructor as well as respond to the instructor's questions with audio chat - just like a normal class. All classes using CENTRA® Symposium are automatically recorded, so the playback can be viewed later.

Features of CENTRA® Symposium (See Fig. 1) include:

- *IP Audio Conferencing:* Fully integrated, multi-way, full duplex voice-over-IP audio conferencing offers dramatic cost savings over traditional telephone conference calls, and allows instructors (the session leader) to identify and manage classroom interaction (who is speaking and/or using the collaboration tools)
- *IP Video Conferencing:* Real-time, multi-point video conferencing enables users to see the session leader or other designated participants from within the virtual classroom

- *Peer-to-Peer Interaction:* The leader can choose to open the "floor" to several participants at a time for peer-to-peer interaction and learning
- *Choreography:* The session leader can control which participants have the ability to speak and interact with the collaboration tools
- *Multiple Presenters:* Centra Symposium supports an unlimited number of co-presenters and subject matter experts
- *Whiteboard:* Multi-user, interactive whiteboard markup, including content created in a breakout room, can be saved for later review
- *Web Safari:* Allows the session leader to take the participants on a synchronized Web tour. Participants can see the leader's "pointer" and will automatically scroll when the leader scrolls up and down on a Web page
- *Application Sharing:* Leaders and participants can share any Windows application, including their entire desktop or even a remote server
- *Feedback:* Participants can raise their hands, indicate yes/no polling, demonstrate laughter and applause responses, utilize public/private text chat, and provide anonymous feedback to the leader and presenters
- *Breakout Rooms and Labs:* Session leaders can break the main session into multiple breakout rooms for group or individual lab exercises. The leader can "look over the participant's shoulder" and even take control of his/her application or provide interactive assistance
- *Session Recording and Playback:* With easy to use features for recording, editing, and storage, users can create professional, self-paced recordings in industry standard formats. These recordings can be viewed outside the Centra environment with any standard media player or included as content within a live or self-paced session
- *Just-in-Time PowerPoint Import:* Co-presenters can upload their own PowerPoint presentations
- *Multimedia:* Supports pre-recorded video clips, audio clips, animated GIFs and other multimedia content including Flash, HTML, and JavaScript. (ECU CENTRA)

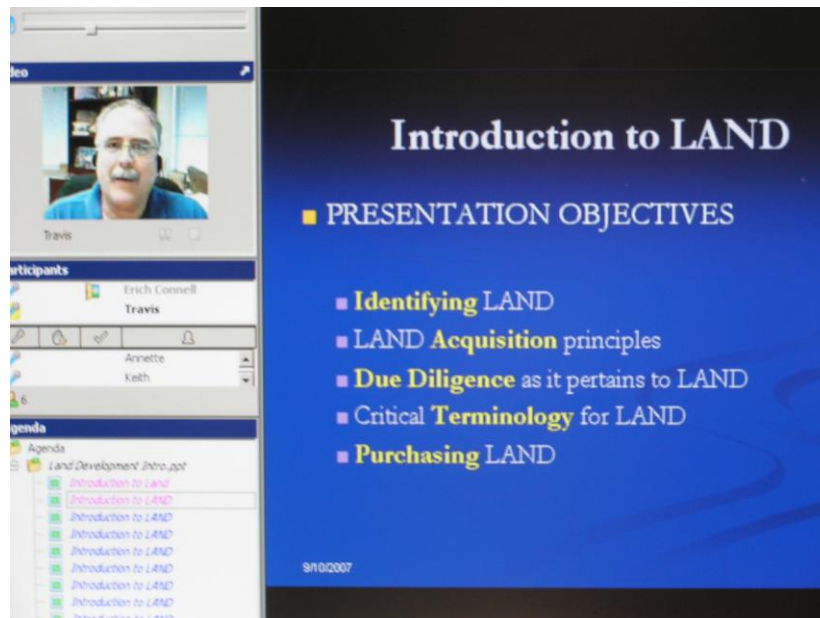


Figure 1: CENTRA® Symposium Computer Screen

Program Details and Implementation

MCM applicants must meet the admission requirements of the Graduate School which include taking the GRE or GMAT examination, submitting all undergraduate transcripts, and complete the on-line application. For acceptance to the MCM degree applicants must have completed an undergraduate degree in either construction management or a related discipline and have completed a minimum of three years of construction management experience after degree completion. Students from other disciplines may also be accepted, but must demonstrate significant experience. Typically this varies from 8-10 years of experience. All applicants must also submit an electronic

portfolio to demonstrate type and extent of construction experience. Each applicant's credentials is reviewed by the departmental admissions committee, who determine if undergraduate deficiencies are present and, if so, will prescribe a method for their removal. These stringent requirements for construction management experience are to insure that all students are on the same knowledge level for in-class discussions. Undergraduate degree students without significant experience would be at a decided disadvantage in our classes.

Class structure is an animated graduate seminar setting. Presentations are provided via a Blackboard site for students to review prior to the weekly web classes. During each session, instructors act as moderators and initiators of questions and discussions. Students are encouraged to lead discussions incorporating their personal construction and company experiences as they relate to the selected subject. The on-going conversations lead to student learning at higher level of understanding.

Each class incorporates a number of papers and paper presentations by students. In addition student-led class presentations are used for many subject areas. Students are encouraged to bring "expert" associates to class to provide another point of view. This emphasis on group interaction effectively eliminate the traditional model of instructor led – student listen/respond model. Dynamic interaction stimulates student learning activities and provides the student with a level of ownership in their education.

Program Growth, Success, and Future Development

With graduate seminar classes beginning in the Fall 2006, student enrollment has continued to grow. Enrollment includes a variety of individuals with diverse educational and professional experience. We have students who are PMs in heavy highway, the railroad industry, small and mid-range commercial construction, industrial construction, specialty construction, custom residential, and large-scale residential construction. These varied industry positions are viewed as a positive step in the development of the MCM program.

Student feedback has been positive to the direction we have chosen for the program. In particular, students felt that admission requirements "...add another aspect of credibility to the program" and "that the solid educational background and experience should continue to be required...because it helps enrich the learning experience of all students and professors." Concerning the asynchronous graduate seminar format, students felt "the program met or exceeded my pre-program expectations" and "the on-line program works well since most students are working full time". The use of the CENTRA® Symposium program was "easy to learn and user friendly" and "...it provided an adequate platform for synchronous training and as we became familiar with the program, it provided a classroom-like setting that worked for most classes".

Students noted that oral communication skills of faculty needed improvement. There were two faculty members that presented on-line for the first time and their skills were less trained than other faculty members. An on-going review of faculty members will be enhanced so that experienced on-line faculty mentors can assist in their development and skills (Graduate Questionnaire).

The diversity of the students resulted in lively discussions and definite differences of opinions. This outcome has made individuals alert to the differences of construction business models and the company policies and standards that shape and form our industry.

The Fall 2008 semester will have the first graduates of the program. Currently they are developing their Research Capstone project. The project is to incorporate a "problem" associated with their company that requires research and a solution developed for implantation. Students identify a problem and select a willing Graduate Faculty member to be their Faculty Capstone Advisor. The outcome of the course incorporates both a written research paper that can meet publication standards, and a formal presentation on the research to the Graduate Faculty. Current subjects include the *Analysis and Development of Mid-Size Construction Company Business Plan* and *Developing a Company Policy for Evaluating New Hires*.

The MCM Program's quality and effectiveness is evaluated by student performance on the Comprehensive Exam. The first four hour exam was administered in November 2008, and incorporates a group of situational questions requiring solutions based on best practice application as covered in the curriculum. The initial examination

questions are developed by graduate faculty teaching the courses, with final questions massaged in a faculty consortium. All comprehensive exams are evaluated by a graduate faculty committee against program objectives and competencies. In addition, alumni surveys will be administered to alumni at one and three year interval after graduation to assess the effect the program had on their employment performance.

As the program grows, availability of classes will increase. Currently we teach three revolving classes in the Fall and Spring semesters, with one class taught during the 11 week summer school period. With the additional student load it is anticipated that five courses will be provided each semester on a revolving basis with the only prerequisite class *Critical Analysis and Evaluation of Construction Documentation* taught each semester. This will continue to allow students to enter the program either in the Fall or Spring semester.

As technology continues to improve and stretch the limits of world-wide communication, we believe that the MCM program will allow a global classroom to partners in this learning environment. As technology becomes second nature to the construction industry personnel, the horizons for our on-line educational environment will continue to grow.

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