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Distance Learning Instruction to Sustain and Improve the Professional Education of Construction Managers

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Abstract
Complex communication and automation systems, web based project management, and construction oriented software systems are all being implemented at a rapid pace. To deal with these technological challenges the construction manager requires skills that were unnecessary just a short time ago. It is natural for higher education, with experience in education and with a strong technological base, to step in and help the industry fill the need for continuous professional training. The paper presents one university's experience using distance-learning and web-based courses in construction education as a substitute for more traditional teaching methods.

Keywords
Construction education, Web-based instruction

1. Introduction

The world of the construction management professional is changing rapidly and almost daily. These changes are mainly attributable to the introduction of new, principally computer related, management tools. The advent of increasingly powerful but less expensive microprocessors has fostered the development of software that has dramatically increased the productivity of the individual manager. Complex communication and automation systems, web based project management, and computer systems in general are all being implemented throughout the industry at a rapid, almost frenetic, pace. The economic success of individuals and construction organizations in the 21st century depends, to a significant degree, on their ability to comprehend and to utilize these systems. This, in turn, requires an educated professional, abreast of modern developments, and with the knowledge that is required for implementation. With the new concepts of globalization, competition in the advancement of construction management has become an unequal race between the developed and systems-smart organizations and those with lesser technological capabilities.

The universities are the natural providers and source for the leaders of the transformation. The various degree programs in construction management have typically been at the forefront of new management tools and advancement in capabilities through research, publications, and innovative thought. Increasingly, however, time and distances are constraints that preclude many industry professionals from pursuing initial or graduate degrees related to their work environment. Simply, the manpower

demands of the construction industry are so great, and the number of true professionals so limited, that individuals who have the will and the ability to take charge and move forward can find meaningful employment without the advantages imparted by a professional education. However, and no matter how well intentioned the individual or the organization, this leads to a widening of the gap in productivity between the technologically advanced firms and those with lesser capabilities.

Universities, in general, are matchless in their ability to level the knowledge based playing fields. They have no vested interest in any one firm or organization, and generally provide the learning experience free from any attachment. While firms and organizations may contract with individual faculty to provide seminars on professional subjects, such as safety or strategic planning, this does not affect the basic mission of the universities, which is to teach, conduct research, and disseminate information. It is in the last of these that the Department of Construction Management at Florida International University is unique. Its distance-learning program was originally conceived as a means for delivering a selected number of graduate courses to a few students. In the last two years it has been extended to include all of the graduate and upper division undergraduate construction management courses that are offered.

2. Discussion

The primary advantage usually cited for the in-class education system is the availability of the instructor, in the classroom, as the session proceeds. While there may be a few that argue otherwise, common sense dictates that the best learning session may normally be provided when there is rapid feedback and student-faculty interaction. Certainly it is the manner in which most of the current faculty learned, and it is the manner in which their predecessors learned. However, as discussed earlier, for many in the profession of construction management, class attendance is not a viable option.

Peterson and Stakenas provided alternative solutions to the time-distance and efficiency problem (Peterson and Stakenas, 1981). In the article, the authors discussed the current status of higher education throughout the United States, the lack of adequate funds to support programs, and the necessity of utilizing the available resources more wisely. While they discussed several different alternative models, the following is worth noting: " … the performance-based approach could maximize educational quality, access, and economy. A performance based system is one in which the instructional processes are designed to foster the mastery of prespecified skill and knowledge … Quality is maintained by granting credit only for the successful demonstration of such skills and knowledge against explicit standards … **Economy and accessibility are achieved through employing system design … relying on student's capacity for self-directed learning."** (Emphasis added). The cogent point to remember is that a successful distance-learning program depends heavily upon the willingness of the student to adapt to the difference between in-class (synchronous) and distance (asynchronous) learning.

To be successful, the Department also considered that any distance-learning program must meet the student's needs. In his article on innovation in the construction processes, Widén remarks that, " regardless of the reason for innovation, the understanding of the client's needs is very important, especially when existing or new technologies are combined to create the innovation" (Widén, 2003). The Construction Management program at FIU has for years sought to meet the requirements of the industry and the working student by holding classes primarily in the evenings and on weekends. Extension of the program through distance-learning was, therefore, considered a natural step. It was also a natural step for the resident student body already accustomed to an alternative style of attendance as compared to the more traditional day-time and full academic life.

In their discussion of the future of construction education, Belliveau and Peter did not consider distance-learning (Belliveau and Peter, 2002). However, in their comparison of traditional and constructivist approaches to construction education, they parallel one of the guiding principles of the distance-learning model adopted at FIU. "…a student cannot expect to come to class and have the material and concepts delivered to them … the goal is for the learner to play an active role in assimilating knowledge onto his/her existing mental framework." Phrased differently, "A level of autonomy is expected from the distance learner …" (Martin and Haque, 2001). Succinctly, the distance-learning student must be willing to accept a greater involvement in the learning process than the in-class student.

The University of Idaho has posted a comprehensive guide and discussion of distance learning on its web site (www.uidaho.edu/eo/distl.html). It points out, inter alia, that " … effective distance education programs begin with careful planning of course requirements and student needs … They don't just happen spontaneously …" As with the previously cited references, they agree that there is more required of the student in a distance learning situation, but they also include the fact that "…the success of any distance learning effort rests squarely on the shoulders of the faculty." The requirement for preparation of distance learning modules normally exceeds that for in-class sessions, placing an additional burden on instructors who may consider that they are being stretched. In addition, the requirement to manage the technological bridges necessary to reach, converse with, and assist the distance learning student adds to that burden. Even with the sophisticated software available at most major institutions, such as WEB-CT as described by Caballero and Yen, the task is formidable for large classes (Caballero and Yen, 2003).

An added point to consider in the development of distance learning for construction management students is the requirements for laboratory sessions. One possible solution is to develop remote control devices wherein students can perform the required experiments through specialized software (Ewald and Page, 2000). However, allowing the prospective distance learning student to complete the lower division courses at a local institution in such areas as mechanics of materials and surveying, obviates the requirement for investment in expensive software and robotics. While this solution may be less than optimal for engineering and scientific courses, it seems appropriate for construction management.

3. The FIU Model

In order to provide the advantages of a construction education to those who, for what ever reason, are unable to regularly attend classes the Construction Management Department at FIU has expanded its participation in the Florida Engineering Education Delivery System (FEEDS). Alone, FEEDS is a logistics system for delivering course content and has nothing to do with the course content or instructional methodology. Normal in-class sessions are recorded and delivered to the asynchronous learner either by VHS tapes, CDs that can be played on the normal desk or lap top computer, or by streaming video. The mechanism is simple in concept and simple in execution as long as everyone plays by the rules. The most significant problem actually encountered is locating the students so that the material can be delivered expeditiously. The student must take the initiative of providing the FEEDS Department with both an electronic and physical address as well as electronically raising their hand or in some other manner informing the FEEDS Department if the material does not arrive.

There is a reverse procedure for tests and quizzes. All tests and quizzes have to be proctored and the FEEDS Department must make arrangements for this to be done. If the student is local (tri-county area surrounding the main campus) the tests are normally given on the University's main or satellite campuses. If the student is located elsewhere in the United States or abroad, the FEEDS Department concludes an agreement with another educational institution to provide the service while students in

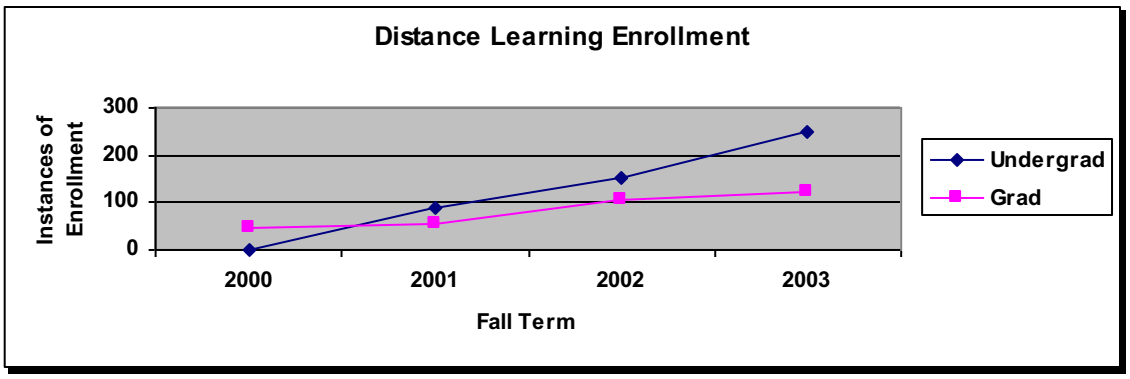
the armed services are normally proctored by their unit's education officer. While sometimes difficult to accomplish, the logistics are reasonably straight forward.

Less straight forward is the adaptation of the instructor to delivering the course content in both the synchronous and asynchronous mode. Class sessions that are normally lecture oriented, with little use of the black or white board, readily adapt to audio-visual presentations. Handouts are actually facilitated by posting them in PDF format on the FEEDS web site before or after class, where they can be obtained by both the in-class and distance learning students. Similarly the course syllabus, out of text reading assignments, etc., can be posted to the site, enabling the student, no matter where they are located, to have access to the material as long as they can log on to the Internet.

Computer laboratory sessions are easily handled since the University's FEEDS Department has installed the appropriate cameras and recording equipment in the computer laboratories. Using split screen techniques, they can provide the distance learning student with both the lecture and the screen that the instructor is using when demonstrating a particular facet of a software program. There is an obvious limitation if the remote student does not have access to the same software. To date this has not been a problem as students have been able to obtain a student version of the program, or the program has been readily available at a cooperating university or college, or it has been available at the student's place of employment. Realistically, at some point in the future this may impose a limitation on the ability to provide the complete curriculum through FEEDS.

The faculty have found it more difficult to adapt certain courses to distance learning. Structural design courses do not lend themselves to PowerPoint presentations, since the graphics can become time consuming and essentially impossible to accomplish without assistance. Similarly, those members of the faculty whose instructional techniques depend upon direct student involvement are often uncomfortable with the fact that there are often more people "out there" than in-class. A different pedagogical approach is required when one cannot depend upon a reasonable size class to generate questions, propose ideas, and participate in discussions

The success of the program thus far can be measured in part by the degree that it has been adopted by the student body. If one 'hit" is considered to be one student enrolling for one course through distance learning, the growth of the program as depicted in the figure, below, shows that the system has been accepted as a viable alternative to in class sessions.



As indicated by the graph, prior to the Fall term of 2001, only graduate courses were offered through distance learning. Subsequently, both undergraduate and graduate courses have been offered in the distance learning mode. Currently all upper division undergraduate courses are offered asynchronously each year, while graduate courses follow a two year cycle.

From the view point of the faculty, this overwhelming endorsement by the students is a mixed blessing. Classroom teachers rely on a number of visual and unobtrusive cues from their students to enhance their delivery of instructional content. To the extent that this is limited or not possible in a distance learning situation, they consider that their ability to effectively communicate with the students may be impaired. Additionally, one cannot emphasize too much, that there is additional effort and time required on the part of the instructor, both in the preparation and the administration of the course. This is an administrative detail that cannot be overlooked. Distance learning, while expanding the campus beyond its traditional boundaries, is not done without an increasing cost to the faculty, time-wise, for each class assigned. Given the time lag between the in-class and distance learning sections, in many respects it is like teaching two sections of the same course; one preparation, but two different sets of assignments, tests, etc. When communication is primarily accomplished through E-mail and attachments, the time involved can be substantial.

Another problem that presents itself is the preservation of academic integrity. Consider the fact that one of the authors of this paper actually had a graduate student approach him with respect to an essay question assigned to another student at another university. *The student at the other school was actually in the process of taking the exam and had e-mailed his friend asking for assistance while the exam was in progress*. Faculty members have to be aware of the ability of the students to communicate, rapidly and take all reasonable precautions to protect the system. Hence, different examinations are normally required for the different sections, etc. Again, all of this places an additional work load on the instructor.

4. Summary

The FIU model is "low tech" as compared to on-line learning modules proposed by others. (As an example of an interactive model, the reader is referred to Sawhney, et al, 2001.) However, as a comprehensive system covering all of the Department's courses, the benefits to the students and the construction industry of the FIU model are enormous.

- *Expansion of the campus boundaries*. Students need not be present, on-campus, to receive instruction. This facilitates students who are in remote areas or who, due to work commitments cannot be in class, to pursue a degree that provides them the education necessary to function adequately in the information age.

- *Continuous improvement in the overall quality of instruction.* The faculty participating in the distance learning program have found that the additional effort required has resulted in a marked improvement in their in-class performance. The necessity to be well organized, to depend more on preparation and less on in-class participation, has improved the overall student assessment of these instructors.

- *Skill Enhancement.* Students, remote from the university, and not desiring a degree can benefit from enrollment in particular courses that are needed to keep them (and their firms) competitive in a communications oriented and technologically oriented business environment. This is already done for many skills in the construction industry, such as safety (Fuller and Davis, 2003). The universities are in a unique position of being able to provide the educational component of training.

However, none of this is without cost. There is the cost of distribution, a cost in the effort required from the faculty, and a less tangible but nevertheless real cost in the loss of contact between the student and the faculty. Two of these can be handled through increased tuition, fees, salaries, or reduced assignments in other areas. In the long run, the most important may be the intangible cost in the relationships lost between faculty and students, and between students and the university.

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