

**UNDERSTANDING TIME COSTS WHEN IMPLEMENTING COMPUTER-
BASED COURSE MANAGEMENT SYSTEMS WITHIN HIGHER EDUCATION**

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General Research Area of Interest

Course management systems are computer-based programs that instructors use to organize course information. Historically, the personal computer has been used for the past three decades in support of education (Cavus & Ibrahim, 2007); however, its role has significantly changed in the past several years from a simple word-processing machine to a collaborative participant in instruction, inside and outside the classroom, responsible for parts of course preparation, facilitation, and sometimes assessment (West, Waddoups, & Graham, 2007; Cavus & Ibrahim, 2007). The question arises, however: when a computer is used to facilitate many aspects of a college course, does it ultimately save the instructor time in both developing the course and facilitating it? And, to address the effects of computer-based course management, how does computer-based course facilitation impact learning and collaboration within the classroom? Before framing these questions further, it is important to understand how computer-based course management has developed and been implemented in the past decade.

History of Instructional Design

Ever since the introduction of the Apple Computer Corporation model IIe in 1977, students and teachers have had the use of a graphical environment to compose, edit and print text (Barr, Gower, & Clayton, 2008). In 1981, Microsoft introduced DOS, which enabled a similar graphical environment to be used to compose, edit, and print text, although Apple remained the de-facto corporation invested in by educational institutions (Bongalos, Bulaon, Celedonio, de Guzman, & Ogarte, 2006). The widespread use of networking, both internally within classroom, and externally to the outside world,

allowed the sharing of information between computers in the early 1990s and by 1995, the World Wide Web was being used in classrooms as an information resource (West et al., 2007). In 1996, the first comprehensive course management tool, WebCT, was released. WebCT, by the very nature of its architecture, was made to be accessed over the World Wide Web. This meant that teachers could upload course material and administer assessments electronically, and students could download course material and be assessed electronically, regardless of their physical location. Moodle, released in 1999, is a freely available competitor to WebCT and now the dominant course management system used by colleges and universities, with a similar feature set as WebCT. By 2003, both WebCT and Moodle started to embrace the so-called Web 2.0 movement, allowing greater interaction between students and teachers through the use of bulletin boards and instant messaging systems (West et al., 2007). As an increasing number of colleges and universities have adopted course management systems such as WebCT and Moodle, research is needed to determine if, and to what extent, computers save instructors time and facilitate learning, during development, administration, and assessment of a course. Current research on the impact of course management systems on instructors has found a pattern of experimentation with the technology, leading to challenges in implementation which are overcome, which lead to adaptation of the technology, and eventually confirmation that their learning experience with technology has been overall beneficial (West et al., 2007). Similarly, the study of the impact of course management systems on students in the classroom by Cavus and Ibrahim (2007) found that learning was enhanced when combined with a course-specific collaborative tool, indicating that successful use of

course management systems must be paired additional course-specific hardware and software.

Qualitative Research Question and Categories of Inquiry

Research Question

How is course development time, administration time, and assessment time affected by a course management system?

Categories of Inquiry

A. Impact of Learning Management Systems on Course Development

How does a learning management system affect course development time?

How are instructors able to transfer educational objectives from a paper-based course to an online course?

Are instructors provided with adequate training before being asked to develop an online course?

Are instructors given access to support during the course development process?

B. Impact of Learning Management Systems on Course Administration

How does a learning management system affect course administration time?

How are instructors able to convey educational objectives to students in an online course?

Are instructors provided with adequate training before being asked to administer an online course?

Are instructors given access to support during the course administration process?

C. Impact of Learning Management Systems on Course Assessment

How does a learning management system affect course assessment time?

How are instructors able to convey educational objectives to students in an online assessment?

Are instructors provided with adequate training before being asked to assess students an online course?

Are instructors given access to support during the course assessment process?

D. Impact of Learning Management Systems on Students

Do students have adequate technical skills to use the learning management system without additional training?

Are students comfortable with a lack of face-to-face administration and assessment?

Is the learning management system culturally appropriate?

E. Impact of Learning Management Systems on Instructional Technologists and Trainers

Is there adequate communication between instructors and instructional technologists regarding design features?

Are higher-level technical issues passed to network administrators in a timely fashion?

F. Impact of Learning Management Systems on Network Administrators

How reliable is the technology that underlies a course management system?

Has student and teacher material ever been lost?

Has the course management system gone down unexpectedly during critical times in the semester or quarter?

Has the course management system ever become slow or intermittently unresponsive?

Have requests for features by teachers and instructional technologists been evaluated and fulfilled? If not, have teachers and instructional technologists been given adequate explanations as to why these features have not been made available?

Justification

A qualitative study to determine the overall effectiveness of course management systems is needed in the field of higher education to determine if, and to what extent such software is needed in the classroom. With pricing the pricing structure for WebCT amounting to over \$100,000 during its final year at San Francisco State University (Bongalos et al., 2006), it is clear that the financial investment in such a system is significant. Moodle, the free equivalent of WebCT, still has significant hardware and personnel costs associated with its administration (Bongalos et al., 2006).

The computers that the learning management system is required to run on must be capable of complex processing and have large amount of memory to maintain simultaneous connections for multiple classes, and be available twenty four hours a day. To this extent, staff must be employed with complex knowledge of database structure and administration. Lastly, there must be technical staff employed to train and assist

instructors with ongoing issues within the course management system. All of these factors drain time and money from the resources of the college or university (Bongalos et al., 2006), and the question must be asked: is it ultimately worthwhile for the school to provide this service?

This question must be addressed qualitatively by first assessing the impact of course management systems on instructors, and then assessing the impact on students. In addition, other stakeholders involved in maintaining the course management system must be queried to construct an overall view of how the course management system is situated within the university. The lack of research surrounding the implementation of course management systems can be traced to expectations of what new technology can achieve, without a full-scale trial to test the impact of its implementation and existing research on the impact of course management systems has only been undertaken in the past 5 years (Barr et al., 2008).

Studies have generally been conducted within computer science and computer engineering departments, as instructors and students in those disciplines have traditionally been early adopters of technology (Barr et al., 2008). However, such studies are not representative of the collective student body of a given college or university (Barr et al., 2008). When a course management system is adopted, the technology and expertise invested to implement it has campus-wide effects. Therefore, research is needed within underrepresented departments to determine potential benefits and drawbacks.

First and foremost, will students from all socioeconomic backgrounds have equal access to this technology, or does its implementation leave them at a disadvantage? Will teachers eventually benefit from a streamlined, organized electronic method of

maintaining course material and administering assessments? Do they find that the system duplicates an effective, paper-based method of course delivery? As mentioned earlier, how effective is the administration and technical staff at helping them overcome specific technical problems during implementation? Are they provided with initial and continuous training? Undertaking a comprehensive study of course management systems can make tremendous contributions to the field of instructional technology. Such a study could suggest an end-to-end approach to implementing a course management system. From preplanning, where it could be determined whether or not such a system was needed, to implementation, where questions regarding transition from paper-based instruction to electronic instruction could be addressed, to post-implementation, where questions regarding ongoing training and future technology budgeting could be addressed.

Literature Review

Introduction

Adopting a course management system to facilitate course instruction has many practical and technical challenges; however, the payoff of having instructors fully adopt and understand the benefits of a course management systems is potentially large, both in time saved developing and administering instruction, and also in the quality and organization of instruction (Bongalos et al., 2006).

Categories/Topics of the Literature Review

There are four major categories that this literature review is divided into, based on the four types of stakeholders involved in a course management system. The literature review will be focusing on the role of the instructor.

The Role of the Instructor

Reviewing the role of the instructor in facilitating a class through a course management system can be broken down into three sub-sections: course development, course administration, and course assessment.

The Role of the Student

The role of a student in navigating a course management system can be broken down into two sub-sections: effects of course management systems on class participation, and effects of course management systems on assessment.

The Role of the Instructional Technologist

The instructional technologist interfaces with the instructor to accomplish stated educational objectives by taking traditionally paper-based material and in-person instruction and converting it to online material.

The Role of the Network Administrator

Furthest away from the instruction is the network administrator, but her or his role in the development of a course management system is critical: the system must be built reliably enough for daily use, and must be responsive to feature requests relayed by the instructional technologist.

Literature Review: The Role of the Instructor

West et al. (2007) discussed instructor experience both in terms of how the course management system was adopted to fulfill specific instructional objectives, and whether the technology was embraced fully, partially, or eventually discarded. The progression of adopting a course to be taught fully within the course management system relied heavily upon an instructor's past experience with instructional technology (West et al., 2007). Most instructors did not have a vast amount of experience in developing and administering a

course using this technology, and so they chose to slowly incorporate features of the system into their teaching repertoire over time (West et al., 2007). For example, an instructor would choose to upload his PowerPoint presentations to the class website during the first semester. During the second semester, he would then use the management system to keep track of student grades (West et al., 2007). Teachers with more technological expertise would choose to do both simultaneously, and would also serve to lead by example for other teachers who were considering what next adopting step to take (West et al., 2007). A study by Samarawickrema and Stacey (2007) came to similar conclusions, in that peer experimentation and adoption strongly influenced reluctant faculty to adopt a learning management system for administration of courses.

The Effects of Previous Technical Experience on Adoption of a Learning Management System

Though previous technological experience also played a role in the speed at which a learning management system was implemented, socially supportive environments, where instructors were comfortable conversing with fellow faculty about their experiences with adapting their course to a learning management system, also influenced the speed of adoption (West et al., 2007). There were also changing roles that instructors played when developing material for an online course. As one interviewee stated “You become an administrator and a teacher and a multimedia developer and you are a researcher and whatever else that I’ve left out” (Samarawickrema & Stacey, 2007, p. 10).

Samarawickrema and Stacey (2007) and West et al. (2007) have looked at the challenges of adopting a course management system from a viewpoint of technical problems an instructor might encounter. Bongalos et al. (2006) detailed specific inhibiting factors an

instructor might encounter while developing and administering a course, such as forgotten passwords for students and teachers, availability of the system during class hours, and overall difficulty of navigation. Prior technical experience was generally helpful in figuring out password issues and navigational concepts, just as West et al. (2007) has found about the speed and ease of transition. Another interesting subject of discussion that merits interest is the students' effect on teachers adopting a learning management system. In an actor-network perspective, both Samarawickrema and Stacey (2007) and West et al. (2007) found that student demand for lecture materials to be accessible online drove instructor adoption of a learning management system. In both Samarawickrema and Stacey (2007) and West et al. (2007) it was the most frequently cited reason for adoption after pressure by the administration to adapt traditional paper-based courses to an online system.

*Can a Learning Management System Ultimately Save Instructors Time in Course
Development and Administration?*

Cavus and Ibrahim (2007) were seeking to answer one of the bigger-picture questions regarding the adoption of learning management systems: can a learning management system ultimately save instructors time in course development and administration? The most common conclusion Cavus and Ibrahim (2007) found was that, in the short-term, course management systems required a significant investment of time to learn skills and then develop course material. In the long-term, course management systems could save significant amounts of time because of the ability to reuse previous online material for the following semester without having to physically prepare and reproduce new material. West et al. (2007) heard a common refrain from instructors they interviewed: not only was the previous semester's course material available again for the next semester,

but additional material that was still paper based could be slowly filtered in over time to supplement the older material.

Extending and Reusing Learning Management System Content

Baudry et al. (2005) suggested both a standardized format for creating lessons, and clearly defined roles for both producers and administrators of instructional material so that not only could an online course be reused by the same instructor, but could be built upon by a colleague. Baudry et al. (2005) proposed that the original creator of the content be called the composer, and the person actually teaching the material be called the publisher. Using a construction metaphor (Barr et al., 2008), individual lessons would be considered bricks, and a model would be presented to demonstrate what these bricks would eventually build. The lessons, however, would have meta-data attached to them describing what the individual lesson sought to accomplish so that they could be used as separate modules. Similar to the SCORM system adaptations to course management systems proposed by Barker (2004), these suggestions to develop content in a unified manner could ultimately save the instructor time in teaching online material without having to develop it from scratch or convert all of it from a paper-based course.

Procedures

Instrumentation

Introduction for Participants

Dear Faculty of San Francisco State University,

We are sending you this brief survey regarding your use of Moodle, San Francisco State's learning management system, because you are actively administering a class within it.

We are conducting a study regarding the amount of time it has taken you to develop, administer, and assess students within Moodle to determine how Moodle differs from administering a course using traditional offline technology.

The results of this study will guide future administrative decisions regarding funding for Moodle training, the hiring of instructional support staff, and how future instructional technology infrastructure is planned.

Please mark the appropriate answers with a checkbox on the website and fill in the blanks.

Thank you for taking the time to participate in this e-mail survey. The results of this study will be made available to you after its completion in June of 2009.

Data Collection Instrument: Survey Questionnaire

Faculty Questionnaire:

Tell us about yourself:

Department _____

Male _ Female _

Years total teaching _____

Years teaching at SFSU _____

Rank: Lecturer_ Sr. Lecturer_ Assistant Professor_ Associate Professor_ Full Professor_

Tell us about your experience with Learning Management Systems

Did you have previous experience with online course management systems at SFSU

PRIOR to using Moodle:

No previous experience _

Blackboard _

WebCT _

Other _____

Did you have previous experience with online course management systems at another university?

No previous experience _

Moodle _

Blackboard _

WebCT _

Other _____

Tell us about your CURRENT courses at SFSU (including offline courses)

First Course

Name _____

Type:

Fully offline _

Hybrid_

Fully Online Classroom-Based _

Fully Online Distance Education _

Hours spent developing course ____

Hours spent per week administering course (outside of classroom time) ____

Hours spent assessing course (outside of classroom time) ____

Second Course

Name _____

Type:

Fully offline _

Hybrid_

Fully Online Classroom-Based _
Fully Online Distance Education _
Hours spent developing course ____
Hours spent per week administering course (outside of classroom time) ____
Hours spent assessing course (outside of classroom time) ____

Third Course

Name _____
Type:
Fully offline _
Hybrid_
Fully Online Classroom-Based _
Fully Online Distance Education _
Hours spent developing course ____
Hours spent per week administering course (outside of classroom time) ____
Hours spent assessing course (outside of classroom time) ____

Fourth Course

Name _____
Type:
Fully offline _
Hybrid_
Fully Online Classroom-Based _
Fully Online Distance Education _
Hours spent developing course ____
Hours spent per week administering course (outside of classroom time) ____
Hours spent assessing course (outside of classroom time) ____

Tell us about your PAST courses

First Course

Name _____
Type:
Fully offline _
Hybrid_
Fully Online Classroom-Based _
Fully Online Distance Education _
Hours spent developing course ____
Hours spent per week administering course (outside of classroom time) ____
Hours spent assessing course (outside of classroom time) ____

Second Course

Name _____
Type:
Fully offline _
Hybrid_

Fully Online Classroom-Based _
Fully Online Distance Education _
Hours spent developing course ____
Hours spent per week administering course (outside of classroom time) ____
Hours spent assessing course (outside of classroom time) ____

Third Course

Name _____
Type:
Fully offline _
Hybrid_
Fully Online Classroom-Based _
Fully Online Distance Education _
Hours spent developing course ____
Hours spent per week administering course (outside of classroom time) ____
Hours spent assessing course (outside of classroom time) ____

Fourth Course

Name _____
Type:
Fully offline _
Hybrid_
Fully Online Classroom-Based _
Fully Online Distance Education _
Hours spent developing course ____
Hours spent per week administering course (outside of classroom time) ____
Hours spent assessing course (outside of classroom time) ____

Tell us about your experiences with Instructional Training:

How many hours of training have you attended (if none, mark 0)? ____
Has the training provided you with enough information to develop a course using Moodle?
Yes_ No_

If "No" what additional training did you need / will you need to use Moodle effectively?

Tell us about your experiences with on-call Instructional Support:

Have you contacted Instructional Support? Yes_ No_ (if "No", skip this section)

Problem #1:

Please categorize the nature of your problem:
Conceptual issue (i.e. how do I set up an online assignment) _
Technical issue (i.e. grades are tabulating incorrectly) _
Request for new feature _
Other: _____

Please describe the issue briefly: _____

Problem #2

Please categorize the nature of your problem:

Conceptual issue (i.e. how do I set up an online assignment) _

Technical issue (i.e. grades are tabulating incorrectly) _

Request for new feature _

Other: _____

Please describe the issue briefly: _____

Tell us about your experiences with the reliability and speed of Moodle:

Has Moodle ever been “down” or non-functional during the semester? Yes_ No_

Has Moodle ever been slow to respond during the semester? Yes_ No_

Population and Sample

The overall population is the faculty and lecturers using the learning management, Moodle, at San Francisco State University. The entire body faculty who are listed as having active Moodle courses during the current semester will be selected as the sample, as all of their e-mail addresses are on file in the Moodle system. The sample will nearly overlap the population, as this survey will be sent to all faculty and lecturers using Moodle via e-mail. The sample size will be approximately 584, given that one-third of SFSU faculty and lecturers utilize Moodle. There will be limitations inherent to this method of sampling. E-mail is a nearly free medium to use, however response rate is significantly less than that of a paper survey, including follow-up e-mails for non-respondents.

Proposed Data Collection Process

The data in the survey will be collected by an online survey tool, Survey Monkey. Respondents will be given two weeks to complete the survey. Non-respondents will be sent a follow-up e-mail at the end of the initial two weeks, and given another two weeks to respond. Survey money will aggregate the responses as they are submitted, eventually resulting in a complete report based on all respondents at the end of the four-week period.

Validity

Internal Validity

This survey is anonymous and all data included in the report will be in aggregate. Nobody will be personally identifiable and will therefore not need to worry about retribution. The responses will likely be more honest with this in mind. This research study will be subject to peer review while being considered for publication. During this process, a panel of experts will assess whether or not data was collected in a systematic and unbiased

manner. If concerns are raised as to the validity of the procedures, the study will have to be revised before being considered for submission.

External Validity

The proposed study's findings can be carefully generalized outside of San Francisco State University if care is taken to consider the differences in operational environments of different universities.

Possible Problem Areas

Possible problem areas include omitted questions, unclear open-ended responses, and inconsistency in course load. Tenured faculty might have a reduced course load and career incentive to devote more time to developing learning management system content voluntarily, whereas lectures might have to balance the demands of increased course load and decreased time to develop material. This survey does not measure voluntary versus involuntary content development.

Projected Data Analysis Procedures

Expected Data

The web-based survey will collect results of the 584 invited participants, of which approximately 70-80% will actually participate in the entire survey.

Data Reduction Strategies

Using Webmonkey's built-in data display software, single and multiple choice data will be reduced to rows indicating questions and columns totaling responses to those questions. Fill-in answers will be sorted by participant under each question heading.

Data Analysis Strategies

A system will have to be developed to code open-ended answers. Single and multiple choice data will be displayed in frequency occurrence graphs. Data can be arranged to test for answer sets among participants that occurred in pairs together, and likewise, comparisons can easily be made between subsets of answers, for example, total course time development by academic ranking.

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