

Report of AC4 subcommittee on course management systems, Mar 2001

Basic assumptions

- Educational Technology is
 - A part of education at UC Davis
 - An *increasing* part of education at UC Davis
 - Moving to the majority of instructors – need new funding and infrastructure models
 - Necessary to maintain competition for the best students
 - Too time-consuming – too much time spent on teaching will damage the missions of research and outreach
 - Reliant on BANNER
- Rising enrollments must be accommodated without loss of educational quality
- MyUCDavis
 - Is here to stay
 - Will include, at least, an entry-level course management system
 - May or may not be the basis of the campus portal but this will not affect the conclusions of this report

Questions

- How should Educational Technology develop at UC Davis?
- Can Educational Technology help with rising enrollments?

Options (not all are mutually exclusive)

- Develop a course management system within MyUCDavis
 - Entry-level
 - Full featured

- Build from scratch
- Link to purchased modules
- Purchase, install, rollout, maintain commercial course management system(s)
 - Replace the course management features of MyUCDavis
 - Run in parallel with the course management features of MyUCDavis
 - Integrate with the course management features of MyUCDavis

Recommendations

- Keep MyUCDavis – as a Tier 1 system
- Develop, or continue to develop, at least some additional educational tools in MyUCDavis
 - Grade book
 - Self-test question module
 - Web-based email
 - Web-based file storage and sharing (MySpace)
- If possible use commercial offerings of the above tools and link to MyUCDavis
- Continue with WebCT pilots and move the WebCT server to the Data Center
- AC4 review of course management systems in 12 months to see if both the course management features of MyUCDavis and a commercial course management system are still necessary
- Review of build/buy decisions for MyUCDavis by AC4
- AC4 should consider sponsoring a symposium, soon, on best practices for implementation of course management services

Report

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What is a course management system?

A Course Management System is a computer program that may be deployed at a variety of levels in an educational institution where all students have access to a Web browser. It brings a degree of automation to the administrative aspects of running courses including some or all of:

- Access control
- (Dynamic) class lists
- Grade books
- Delivery and grading of web-based assessment
- Management of assignments (web delivery, drop box, grading, follow-up)
- Synchronous communication tools (chat rooms)
- Asynchronous communication tools (Web pages, email lists, archives, bulletin boards)
- Links to back-end student information system

In addition, a course management tool provides some automation of the educational aspects of course delivery: knowledge (K), skills (S) and attitudes (A). The automation is in the form of tools and frameworks, including some or all of:

- Self assessment (KSA)

- Synchronous communication tools (chat rooms) (KSA)
- Asynchronous communication tools (Web pages, email lists, archives) (KSA)
- Framework for on-line materials (organization, navigation) (K)
- Tools for building on-line content (HTML page builder, animations, simulations) (KS)
- Interactive skill building and testing (S)

There are many course management systems available, many originating on university campuses, and they are widely used in distance education programs and increasingly to automate administration of on-campus courses. There is a significant variety of commercial offerings including WebCT, Blackboard CourseInfo, TopClass, Eduprise, and a similar variety of campus-specific systems, including Catalyst at University of Washington, Angel at University of Indiana. UC Davis provides some of the features of a course management system through the MyUCDavis web portal, including:

- Dynamic links to BANNER student information system, for students
- Access control
- Dynamic class lists for faculty
- Synchronous communication tool (chat rooms)
- Asynchronous communication tools (Web pages, email lists, archives, bulletin boards)
- Tools for building on-line content (text to HTML converter, file upload capability)

What are the advantages and disadvantages of different approaches to a course management system?

Given a need for a course management system at UC Davis, there are three broad approaches:

- Adopt one or more complete commercial system(s)
- Build additional course management features into MyUCDavis
- Purchase modular components and link them to MyUCDavis

Complete commercial systems:

These are systems, like WebCT and Blackboard CourseInfo, that provide end-to-end solutions. This market is currently crowded and dynamic with partnerships being built between providers of Student Information Systems and Course Management Systems to create integrated products.

The main advantage of a complete commercial system is that the development effort is spread across many customers (many campuses). This leverage is likely to be of considerable importance as course management systems increase in complexity and value. The immediate benefit is rapid deployment of a wide range of features.

There are also disadvantages and their significance depends on one's faith on the commercial providers, which in turn probably depends on a competitive marketplace. Should UC Davis try to build partnerships or try to foster competition? This strategic question should be addressed by AC4. This report sets out the options in these areas from an academic point of view but we recognize the parallel importance of the business perspective.

Complete commercial systems are still undergoing rapid development so that, for example, their integration with BANNER will require substantial local programming. Even when WebCT offers a link product between WebCT and BANNER, the extensive modifications that UC Davis has made to its installation of BANNER may require initial and ongoing local programming. Similarly, although commercial systems are relatively full-featured in the course administration area, the features are generic and may need tailoring to UC Davis.

Complete commercial systems can handle the administrative features of a course management system on a scale suitable for our Campus. However, some, including WebCT, currently lack features of scalability, security, and reliability (clustering, failover, Kerberos) that would allow UC Davis to adopt them as Tier 1 systems¹ and there are questions about their ability to scale their course delivery features to a high-demand situation.

Current commercial systems focus on automating learning through one-on-one and group discussions and problem solving, and less on automating active learning. In fact, much of the content presentation is very passive. Using on-line discussions to compensate for a lack of face-to-face time is necessary in “long distance” education, where these systems have been widely deployed. On the other hand, UC Davis needs more focus on active learning on the Web as an alternative to lectures in classrooms that don’t exist or are too small. The face-to-face interaction that UC Davis students experience, with other students and with faculty, is a distinguishing feature of the residential education that we provide. Educational technology, at UC Davis, should be used to enhance these face-to-face interactions, not to replace them. Thus, although commercial course management systems are continually broadening their scope, UC Davis’ needs with respect to course management technology may not exactly match the purposes of course management systems designed initially for “distance education”.

Some campuses have implemented more than one commercial course management system, simultaneously. This approach allows faculty to choose the system that best meets their needs and builds experience that the Campus could use for future decisions. On the other hand, it increases complexity for students, who have to navigate different systems in different courses. Similarly, it creates additional costs for linking each system with BANNER. Whether or not UC Davis makes a central decision to adopt a commercial course management system, it is likely that some units will choose to use such systems within their own areas. One argument for a prompt central adoption is that it may encourage the same choice for distributed systems and so reduce the number of systems that need linking to BANNER.

Building course management into MyUCDavis

In many ways this is the counterpoint to adopting a commercial course management system. The main advantage is that the integration with BANNER is already done. In addition, the programming can focus on UC Davis’ needs. The main disadvantage is that it will become increasingly difficult for a one-campus programming effort to keep pace with commercial offerings, even with a focused approach, which will lead to escalating costs and, possibly, lack of needed features.

¹ <http://adc3.ucdavis.edu/adminplan/q3.html>

UC Davis’ computing systems are classified into 3 tiers. Tier 1 is “mission-critical” which MyUCDavis will become when it is the primary source for information that students need to complete their courses.

Components

Ideally, components of a course management system would be purchased and linked together through MyUCDavis, using standard interfaces. Unfortunately, there are few such standard interfaces and most of the companies in this area are focusing on providing monolithic, vertically integrated, “solutions” that cannot be broken down into separate modules. The committee favored the modular approach because of its business and academic flexibility but concluded that it is not feasible at the present time. It should be re-evaluated in 12 months.

Nevertheless, some individual programs are available for self-test questions² and grade books (Appendix A) for example.

Some standards are being developed, for example by the US Department of Defense, by the IMS Project (an outgrowth of EduCause), and by the IEEE³. In embracing standards the campus needs to take great care to avoid mechanisms that involve transferring copyright to a publisher or equivalent. Mechanisms such as MERLOT⁴, and the UC Teaching and Learning technology Center, which foster exchange of educational modules without owning the copyright, should be encouraged.

What is the demand/need for a course management system at UC Davis?

The digital divide between UC Davis faculty and students is large and growing. Bridging this divide requires empowering faculty to use educational technology. UC Davis has several initiatives aimed at empowering the faculty including the SITT⁵ program of the Teaching Resources Center, the tools including MyUCDavis developed by IET and Student Affairs, the classroom facilities installed by ISAG⁶ and maintained by IET, drop-in consultation at the Arbor, and a new program, from IET Mediaworks, that involves using students to assist and train faculty, building on the notion of the university as a community of learners. However, these activities do not yet affect the majority of the faculty. Fundamental to these efforts are the tools that make it easier and *quicker* for faculty to adopt and use educational technology. Educational technology must improve efficiency in the administration and delivery of courses. Course management systems promise to tackle this problem, particularly course administration at the level of the individual course and instructor. Course management is an essential component of the bridge over the digital divide.

Of course, the digital divide is an over-simplification. Some faculty members, the pioneers, are already using sophisticated applications of educational technology. This group may make use of some features of course management systems but they will probably make little difference to this small group. Other faculty members are early adopters, such as those who participated in the pilot programs. This group is knowledgeable about educational technology, will expect a wide range of features, and will be prepared to spend time learning how to use them. They may be the main users of a commercial course management system at this time. The third group is just

² For example, QuestionMark (<http://www.questionmark.com/home.htm>)

³ Institution of Electrical and Electronic Engineers, an important international standards body

⁴ www.merlot.org is widely supported and funded by academic institutions. It provides peer-review of modules of course content and facilitates their use by others.

⁵ Summer Institute on Technology in Teaching

⁶ Instructional Space Advisory Group

starting to use educational technologies such as email, automated class lists, and electronic grade-submission. This group needs entry-level course management features, which are included in MyUCDavis. At this time, this group is probably well served by MyUCDavis and would not welcome the added complexity of a full-featured course management system.

Thus, there are broadly three types of instructor who may need three levels of course management:

1. Entry-level (majority faculty, MyUCDavis)
2. Intermediate (early adopters, e.g. WebCT)
3. Custom (faculty engaged in educational research, e.g. RCT, MoBy)

This strategy involves keeping MyUCDavis as an entry-level system, adopting a commercial course management system such as WebCT for faculty with greater demands, and recognizing research activities.

A three-level strategy is quite equivalent to adopting more than one course management system and would encounter similar problems including disparate systems for students to master and difficulty providing a development path for faculty who outgrow the entry level. There is a significant burden on the middle level to justify its existence at UC Davis. Level 1 (entry-level) will be served by MyUCDavis at least in the near future, and level 3 (research) is a natural part of a research university. Eventually, however, it is possible that the commercial systems now envisaged to serve the middle level will expand to meet the needs of all levels and will become the system of choice. Alternatively, it is possible that MyUCDavis and one or more of the level 3 applications will converge and squeeze out the need for a commercial system.

A number of research projects is underway at UC Davis, supported by a variety of mechanisms including grants from the office of the Vice-Provost—Undergraduate Education⁷. There are also projects supported by extra-mural funds and/or collaborations with publishers⁸. Such research activities are appropriate in a research university and their support should continue. From the point of view of course management systems, MyUCDavis, and commercial systems like WebCT, allow students to jump out of the system into a research environment using HTML hyperlinks. In addition, MyUCDavis uses a campuswide authentication system, based on the Kerberos standard, which allows the possibility of moving between MyUCDavis and a research system fairly seamlessly with a single logon⁹. This ability of MyUCDavis to act as a portal and to complement research systems is a valuable feature that should be maintained.

⁷ Undergraduate Instructional Improvement grants (UIIP) administered by the Teaching Resources Center and Instructional Uses of Computers (IUC) grants administered directly by the Vice-Provost's office in consultation with the Education subcommittee of the AC4. These grants are peer-reviewed.

⁸ Examples include Professor Walters' Remote Technical Assistance program and Professor Matthews' MoBy content delivery program, both of which have received significant extramural support and have been adopted by more than one instructor on the UC Davis campus and elsewhere. Coleman and Potter's work on Physics 7 should also be mentioned in this context. There are also several partnerships with commercial ventures, such as Professor Utts' on-line course in statistics.

⁹ A single logon depends on the research system implementing the campus Kerberos-based authentication system.

The majority of UC Davis faculty members fall into the “pragmatist” or “careerist¹⁰” group with much smaller numbers of pioneers/early adopters and principled non-adopters (see the LEAD report below). Thus, if educational technology makes sense in a practical way and in merit advancement and promotion, UC Davis will see widespread adoption of educational technology. An effective course management system is a key piece of making educational technology practical.

A report sponsored by the AC4 and carried out by IT¹¹ and the TRC addressed educational technology needs on the UC Davis campus (<http://lead.ucdavis.edu>). Some of these needs have been addressed, at least in part, by MyUCDavis, including:

- Develop role/task-based portals
- Provide faculty access to full course management functionality through MyUCDavis portal
- Provide ... functionality through student portal
- Provide collaboration and communication tools for informal collaboration

Other areas, not part of MyUCDavis, still need attention, including:

- Evaluate web server/middleware/database combinations and develop selection guidelines
- Provide design guidelines for campus developers of instructional systems
- Evaluate digital repositories for instructional use

MyUCDavis, in its pilot phase, was evaluated with a questionnaire and an analysis of usage logs¹². “Overall the responses were constructive. Many respondents noted the usefulness of the site and appreciated the convenience of the web-based email feature. Many respondents found the portal to be a great idea and hope it will continue.” On 3/13/01, the statistics on the MyUCDavis site¹³ reported 50 unique instructors who are using or have used the course management features of MyUCDavis during the current pilot phase, primarily the Fall 2000 and Winter 2001 quarters.

While the MyUCDavis pilot was in progress, the TRC and IET also offered pilots of two popular commercial course management systems, Blackboard CourseInfo and WebCT.

The initial pilot offering (Spring 2000) was designed to compare Blackboard CourseInfo and WebCT. The products were investigated from both a technical and a user viewpoint. Both companies attended meetings on campus to present their product and to answer technical, support and user questions. Ten faculty members were recruited and their progress was followed as they used one or other of the products. The final recommendation of that pilot study was to offer WebCT in a limited production mode. See <http://trc.ucdavis.edu/courseware>.

¹⁰ A “careerist” is one who makes decisions primarily based on how it will affect directly his/her career (rather than institutional priorities or research curiosity, for example).

¹¹ IT is the former Division of Information Technology

¹² MyUCDavis Pilot Survey Results 1/25/01, Information Resources, Information & Educational Technology
MyUCDavis Usage Statistics 1/25/01, Information Resources, Information & Educational Technology

¹³ <http://my.ucdavis.edu>; log in and select the “stats” link at the top right-hand corner of the individual home page.

During Winter and Spring 2001, the TRC and IET have been offering WebCT to a small number of instructors. (Currently a total of 23 faculty and 700 students have used the product). The primary goal of this phase of the pilot is to address the support issues—specifically, to determine the feasibility of linking WebCT to the highly customized version of BANNER implemented on campus, and to determine the faculty training and support requirements. Results of this ongoing study will be posted at <http://trc.ucdavis.edu/courseware>. UC Davis' WebCT site is: <http://courses.ucdavis.edu>

Data from all the pilots must be viewed in the context of three factors: small numbers; early adopters; scalability.

- Small numbers are inevitable at the beginning of a pilot and limit the validity of the results; however the data collected informs the decision whether to develop or abandon the pilot programs.
- The participants in the pilot projects are early adopters, by definition—they volunteered to be the first to use these pilot course management systems. The early adopter issue is particularly problematic in generalizing the results of the project. Our current main target is the majority of UC Davis' instructors, sometimes referred to as “second wave” instructors or “careerists”. Some tools and procedures that have been developed for early adopters work poorly for second wave instructors.
- Some of the procedures used in the WebCT and CourseInfo pilots are not scalable, including manual generation of class lists, training, and support mechanisms. There are also questions about the technical scalability of all the products.

The LEAD report did not specifically tease out the issue of rising student enrollment because it was focused on faculty perceptions of needs. In general, the needs identified in the LEAD report are greatly exacerbated by rising student enrollment.

Nevertheless, educational technology can make a specific contribution to alleviating the problems of accommodating rising student enrollment through offering classes or parts of classes online, reducing the demand for over-booked classrooms¹⁴. This use of educational technology puts heavy demands on those on-line learning activities that lead to changes in student knowledge, skills and attitudes. Effective education requires both active learning and discussion activities, either or both of which could be provided or facilitated with on-line materials and tools. Active learning, in particular, may need tools, frameworks and other support that go beyond those currently available commercially.

Course management systems at other campuses

An informal survey of other UC campus systems is in progress. UCLA has a homegrown portal, MyUCLA, as well as limited implementation of WebCT. UC Riverside has a portal/front end to Web Course in a Box and Blackboard CourseInfo. They are discontinuing Web Course in a Box, for usability reasons, but are maintaining the legacy courses on that system. UC Berkeley is offering both WebCT and Blackboard CourseInfo. UCSF has just established a Center for Instructional Technology focused around creating a digital curriculum using WebCT. UCSC is encouraging faculty to use WebCT. In general, other UC campuses appear to be at a similar stage to

¹⁴ This strategy is being carefully evaluated at UC Davis with the support of the Andrew W. Mellon Foundation. The UC Davis project is described at <http://CloudyBay.ucdavis.edu/Mellon/>.

UC Davis in this decision-making process. Some other Universities offer models built around portals or around commercial course management systems. For example, University of Washington built Catalyst, a product that provides course management features, and University of Indiana has a similar venture called Angel. CSU Sacramento has adopted WebCT. There are other examples of both approaches.

The committee suggests that AC4 consider hosting a symposium with contributors invited from appropriate campuses who have implemented either the homegrown or the commercial approach or both. Such a symposium could focus on best practices for implementation, to allow UC Davis to make optimum use of the next 12 months of continued deployment of both homegrown and commercial systems. The symposium would also highlight the strengths and weaknesses of the approaches, allowing UC Davis to devise better evaluation strategies.

How mature are course management systems?

The market is highly fragmented with many institutions building their own course management system. There are some identified market leaders but the situation is in rapid flux. For example, one of the most popular packages, WebCT, currently lacks the following features that are necessary for a campuswide system that is expected to reach Tier 1 status within a few years:

- Kerberos support (ability to integrate with UC Davis' existing authentication methods)
- Industry-standard relational database (ability to exchange, retrieve information with other systems)
- Implementation of metadata standards (needed for management and exchange of course content)
- Dynamic links to Student Information System
- Ability to cluster multiple servers (necessary for scalability)
- Code stability (rapid major upgrades)
- Flexibility for content delivery
- Modularized tools
- Ability to co-ordinate with MyUCDavis

While some other commercial systems may meet some of the above deficiencies, they may lack other features that WebCT has. WebCT, and other companies, generally recognize these issues and have plans to address them in a 1 or 2-year time frame (vaporware).

On the other hand, at the level of individual courses, these systems do have a good collection of features that are very helpful to instructors in running their courses.

Costs

Current costs for course management systems are reasonable. However, they are expected to escalate significantly in the short term. There are some novel funding models, such as advertising, but it seems likely that UC Davis will rely mainly on traditional funding methods.

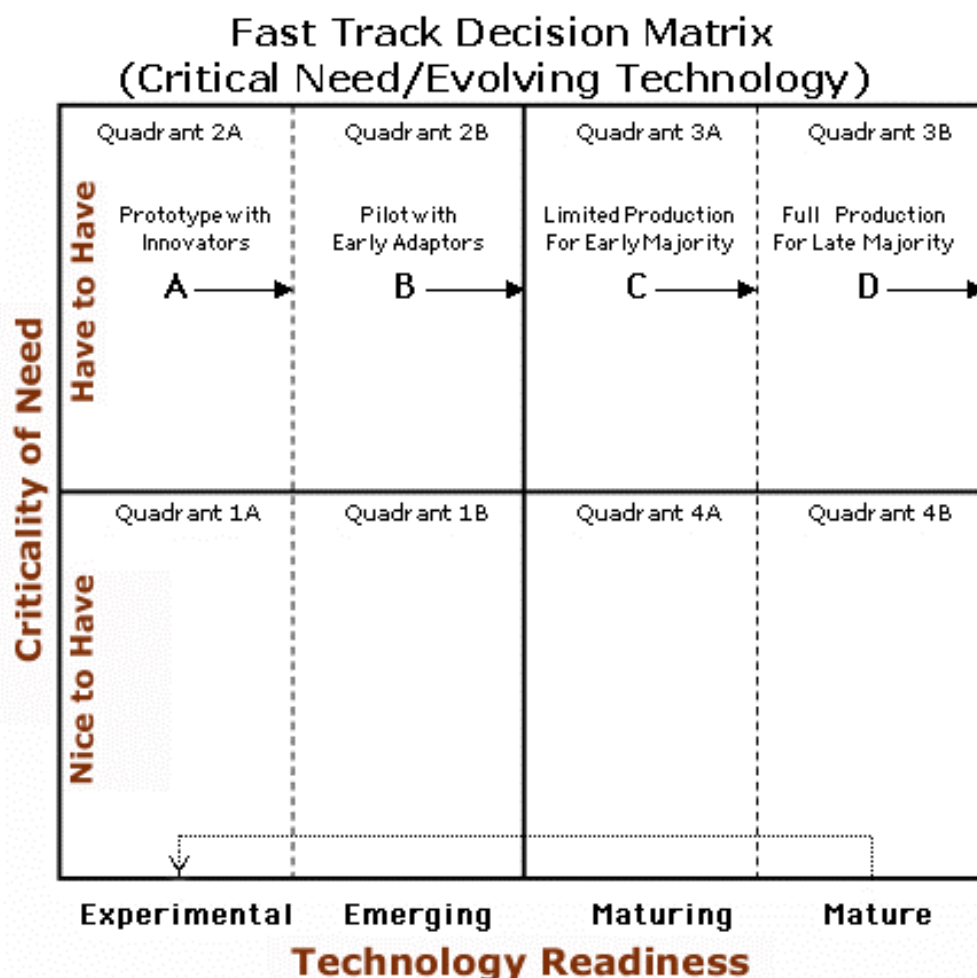
There are immediate costs associated with the recommendation for limited development of MyUCDavis and for expansion of the WebCT pilot. In particular, the WebCT server should be located in the Data Center, which would require purchase of a computer and its installation and

maintenance in the Data center, about \$20,000 for the next 12-month period. TRC and IET would continue to maintain the pilot program. Not doing this involves a risk of major downtime of the WebCT server, which would seriously disrupt the courses housed there. AC4 should consider whether Instructional Technology Funds should be used to support the 1-year continuation of WebCT and MyUCDavis, with the enhancements recommended, or if another fund source should be recommended.

The alternative to adopting course management in some form is increasingly inefficient use of faculty and staff time and increasingly poor service to students, in comparison with our peer institutions and faculty and student expectations.

Recommendations

The LEAD project proposed a fast track decision matrix for determining technology adoption policies¹⁵.



¹⁵ <http://lead.ucdavis.edu/report.html#mapping>

To use this matrix, we have to determine the criticality of need and the technology readiness of the proposed solution. The committee ranks the criticality of need as “Have to have” rather than “Nice to have”. The technology is in transition between Emerging and Mature. The matrix then puts us in a transition between “Pilot with early adopters” and “Limited production for early majority”. We are clearly not yet at the “Full production for late majority phase”.

The committee endorses the results of this analysis and recommends expanded deployment of both the course management features of MyUCDavis and one or more commercial course management systems including WebCT, as well as continued support for research activities. This recommendation has immediate budgetary implications, first for development costs for MyUCDavis and second for moving the WebCT pilot to the Data Center where it will have high availability. The use of these features and programs should be evaluated in about 12 months to see how far the technology has matured and if it is then feasible to move to full production of one or more of these services.

Social change and the advent of UC Davis’ student computer ownership expectation¹⁶ are driving expanded use of the Web for course content and assignments by both students and instructors. With the loss of the constraint of needing to provide for students without computers, there will be a growth in the amount of essential course information that is *only* accessible via the Web. As this happens, the course delivery systems will become mission-critical. The committee recommends that MyUCDavis be regarded as a Tier 1 system and be reviewed by AdC3 in that light. AdC3 should also review the plans for development of MyUCDavis, especially the build or buy decisions for new services.

Appendix A

Examples of commercially available grade book software:

Gradestar - <http://www.shelltech.com/>

Gradebook2/Excelsior's Pinnacle System -
<http://www.gradebooksales.com/softservegradebook.htm>

Diploma Software - <http://www.brownstone.net/educators/index.asp>

ThinkWave Educator - <http://www.thinkwave.com/learnmoreabouteducator.html>

Grade Machine - <http://www.mistycity.com/>

Decision Academic Graphics - http://www.dag.ca/html/gradebook_higher_ed.html

¹⁶ <http://computerownership.ucdavis.edu/>