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# An Evaluation Framework for Course Management Technology

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## Overview

Web-based course management technology is now commonplace in higher education. More than one-quarter of all classes use a course management system, and over 80 percent of campuses have established a single product standard for these systems, predominantly Blackboard or WebCT.[1] In the context of classic diffusion, a first round of adoption appears to be nearing its end, and a second round is starting. The current iteration integrates course management technologies into the underlying fabric of campus infrastructure and focuses on fundamental teaching and learning requirements.[2] Course management technology requirements include such items as fitting into single sign-on portals[3] and integration with library systems.[4] The term "course management technology" includes course management systems, content management systems, learning management systems, or any other course support structure, however constructed, including portal-based services, whether purchased or developed locally.

Evaluating course management technology options challenges higher education decision makers. Presently, decisions about course management technology might appear to boil down to choosing from among two to four products. Course management technology evaluations have typically focused on comparisons of feature checklists[5] and on costs, often narrowly defined as license fees. In fact, a wide range of options is available. With potentially significant investments at stake and concerns of pedagogical effectiveness in mind, decision and selection processes should rely on a framework that focuses on the processes that underlie creating, preparing, teaching, and taking a course.

When faced with a decision about determining next steps for a course management system at Brandeis University, we decided to step back from a traditional comparison of features. In Project CMS@WBW.edu, we collaborated with Wesleyan University and Williams College to obtain a broader viewpoint for developing a more robust evaluative framework.[6]

This research bulletin describes the evaluative framework that we developed and used to seek a deeper and more informed analysis of course management technology requirements. It focuses on the gain (or loss) in learning effectiveness and efficiency and on the total cost of ownership. Rather than starting with lists of features, the framework begins with the processes that course management technology supports. It takes the views of both students and faculty into account, as recommended by Halloran,[7] and sets up an analysis similar in spirit to, but considerably deeper than, that recommended by Landon[8] on the Western Cooperative for Educational Technology Edutools Web site.

## Highlights of the Evaluation Framework

The evaluation framework examines the teaching and learning processes supported by course management technology. It is critical to start with processes underlying any course: creation, preparation, teaching, and participating in (taking) it. It made sense to us to think about the life of a course and how these processes link to its life. Course

creation takes many forms, but they boil down to instructor decisions about content. What material will the course cover? With the content in place, the course is prepared for use with attendant items, from scheduling to enrollment. When can the course be taken, and what are the rules that govern taking it? How do we make sure students have access to materials to support learning? The student, in turn, has to access and interact with course resources. How do students obtain course materials or measure their progress in the course? These types of processes provide the basic structure for the evaluation framework.

If a selection methodology assumes a course management system *a priori* and simply uses feature checklists for evaluation, it might fail to identify associated benefits and costs. To make sense of the processes of creating, preparing, teaching, and taking the course, we have to weigh the process components to assign process benefits. We need to have opinions from students as well as faculty to ferret out the requirements of both groups and to assign value to products and features. Finally, we must be realistic about the true costs of ownership.

## Determining Process Benefits

The first step in evaluating course management technology is to determine which processes are critical by assigning benefits to them and to features that support them. This assignment must be based on relevant institution-specific data because the benefits derived from the same process are likely to vary from institution to institution and from situation to situation. Supporting synchronous communication, for example, might be more important in a pure, distance-learning setting than in a campus-based class, and it might be more valuable to use the Web as a channel for feedback in a large lecture than in an intimate seminar.

The benefits derived from the use of course management technology typically fall into two categories: improving learning (providing more effective education) and gaining efficiency (increasing student and faculty productivity). These benefits are interrelated. For example, reducing time spent on administrative tasks might positively impact learning by allowing faculty and students to devote more time to curricular activities.

We can obtain data about use in two ways: by asking faculty, staff, and students to express their opinions and by measuring actual usage. We also need to take institutional objectives into account.

Sources of data that might be used to determine the benefits of each process include

- **Stakeholder input.** The opinions of faculty, staff, and students are important in any decision about course management technology. A good way to evaluate the benefits and value of course management processes for these groups is to ask for their opinions through surveys. Halloran reminds us that it is important to involve both students and faculty and to choose a representative sample.[9]
- **Empirical data.** An institution entering a second round of adoption can look at how existing technology is being used to determine benefits. It is important to recognize the difference between using a feature and supporting a process. A

bulletin board feature in a course management system, for example, may be little used, but a large number of classes may actively use e-mail. Asynchronous communication may be an important process even if a particular way of supporting it is not popular.

- **Strategic initiatives and institutional planning.** Strategic initiatives and institutional planning should inform decisions about supporting a teaching or learning process. The benefits derived from technology may shift if a new professional school is about to be launched, if programs are about to be dropped, or if a mandate exists to increase diversity through distance education.

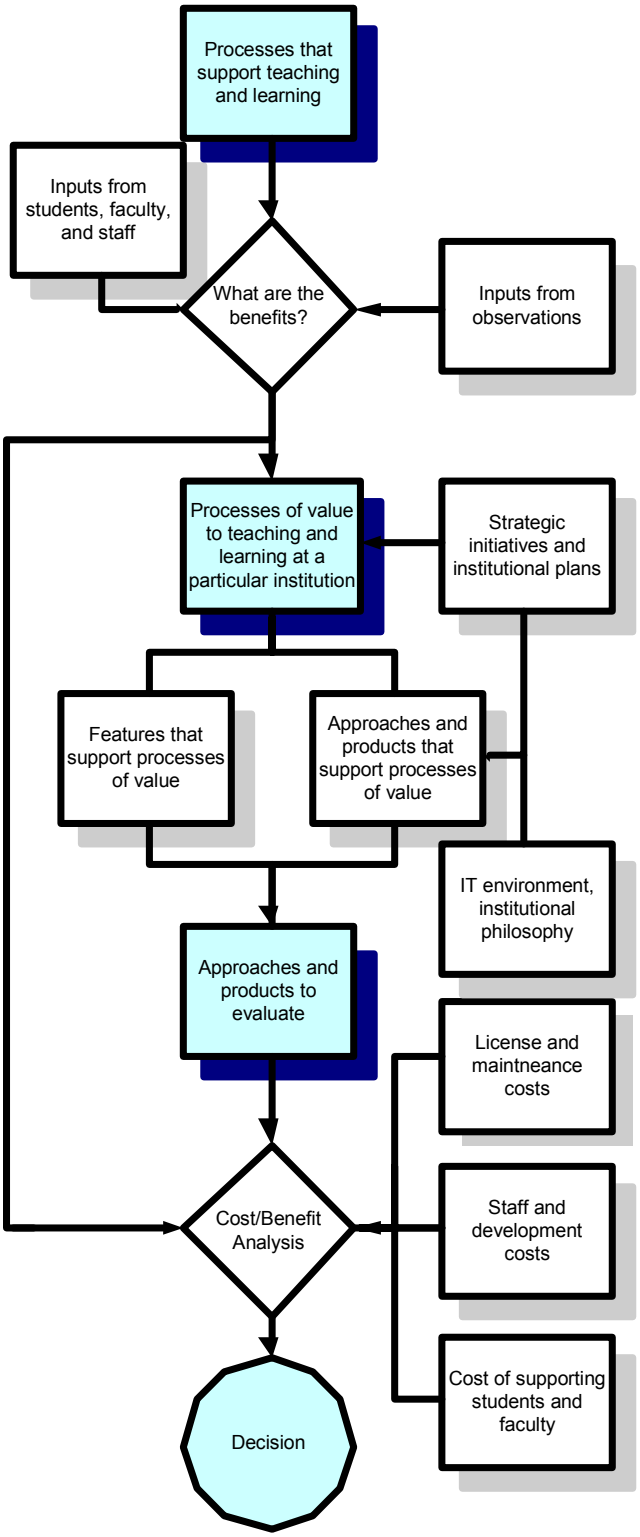
## Assigning Value to Products and Features

After process benefits have been assigned, it is time to look at the value of features and products. In a selection process, the goal, illustrated in Figure 1, is to identify a list of approaches and products to evaluate. In evaluating an existing course management technology for effectiveness and appropriateness, the institution must identify and assess the most important features and uses.

Processes can be supported in multiple ways. Any of the following, for example, could support synchronous learning:

- Chat room
- Whiteboard technology
- Instant messaging
- Videoconferencing
- Teleconferencing
- Classroom

**Figure 1. Evaluative Framework Process Flow**



Because any technology that supports a process can be implemented in several ways, institutions should not assume that a course management system is necessarily the best option. For example, Woolley[10] listed more than 63 products classified as general-purpose Web conferencing products, another 20 chat and instant messaging products, and 13 video-, audio-, and phone-conferencing products. These examples include application service provider models that can be integrated into a campus infrastructure, Java and HTML clients that can be used in a campus environment, and server-side technology that can be installed and may already be present on campus. The technology may be commercial (Microsoft Exchange Conference Server, for example, supports application sharing, chat, a whiteboard, and "real-time" file exchange) or in the public domain.[11]

In determining which of the available approaches should be evaluated, the fundamental metric is the benefit derived from the technology. When examining technology in use, this metric determines which features, tools, and support mechanisms (such as help desks and training) should be assessed in more depth. In the broader context of a selection process, considerations of existing technology, strategic initiatives, the information technology environment, and institutional philosophy can all play a role.

## Assigning Costs

In times of increasing license fees and extreme budget pressures, costs of ownership are paramount in evaluating and selecting any technology, and even more so for technology supporting the core teaching and learning missions of higher education. Just as it is important to look beyond feature lists when evaluating the benefits of course-related technology, it is important to look beyond license and maintenance fees when evaluating costs. Even so-called free products need to be supported. Upgrades must be maintained, and users require support. Some institutions might be able to provide support to their own users, but a legitimate question for anyone buying mission-critical software to ask is, "Where's the 800 number?"

As course management technology becomes more integrated into the campus infrastructure, the cost of integration must also be taken into account. These costs could involve in-house development or consulting fees, product purchase fees, and the costs of components and robust architectures to provide redundancy and prevent catastrophic failure. Support for industry specifications and standards[12] is important in determining the durability and maintainability of a given solution.

In industry, people's time is generally recognized as the greatest expense in developing technology. Buying services, which represent people's time as well, is a significant cost in the commercial e-learning industry.[13] In educational settings, time must also be considered as part of the cost of a product. When comparing an in-house or freely available solution to a commercial solution, it is important to estimate the costs of development, support, and management of outside vendors. These costs vary greatly, and they can be significant whether software is hosted locally or delivered through application service providers.

# Change Implications in Course Management Technology

A number of current development trends in the academy may determine the future direction of course management technology. Areas such as portals and component-based architectures, reusable learning objects, digital libraries and search engines, and new competitors potentially affect the cost/benefit equation for course management technology.

## Portals and Component-Based Architectures

A portal that provides a gateway through a single sign-on to student services such as course management technologies and a drop/add form is a powerful option. Portal components can include items such as support for a localized search engine or access to electronic reserves and other library services. Some institutions have integrated portal technologies with course management technologies, and the potential to support teaching and learning through a portal model is rich.

## Reusable Learning Objects

Reusable learning objects may provide a flexibility that compels an entirely different model for supporting a course. The flexibility in course management technology that allows including self-contained learning components like a simulation, an interactive diagram, a set of exercises or questions, or a good exposition and that can be used in a variety of contexts may be an attractive alternative.

The EDUCAUSE National Learning Infrastructure Initiative (NLII) has made learning objects a key theme for 2003, and repositories of educational learning objects are being built around the globe.[14] Projects like the Instructional Architect at Utah State University[15] are creating tools for assembling learning objects found in digital libraries and other repositories. Learning objects are being instantiated using standards[16] that are ever more deeply embedded into corporate technology but that have been only partially accepted by the makers of leading academic course management systems.

Learning objects bring two benefits: time savings and reusability. The ability to use the same content on multiple platforms and in different settings saves development time, and increased availability of quality content provides objects that can be reused in multiple contexts.

## Digital Libraries and Institutional Repositories

An implied tenet of course management systems is that course content needs to be managed separately from other content. Yet it seems to make more sense to put all content under the same roof. This notion is the idea behind university-based institutional repositories, defined by Clifford Lynch, executive director for the Coalition for Networked Information, as a set of services relating to managing and disseminating digital materials created by the institution and its community members. As Lynch pointed out, “A mature and fully realized institutional repository will contain the intellectual works of faculty and students—both research and teaching materials—and also documentation of the

activities of the institution itself in the form of records of events and performance and of the ongoing intellectual life of the institution. It will also house experimental and observational data captured by members of the institution that support their scholarly activities."[17]

The strategic importance of institutional repositories cannot be underestimated, nor can the importance of vertical repositories serving specific communities of practice. A good example of the latter are the more than 60 independently maintained collections associated with the National Science, Mathematics, Engineering, and Technology Digital Library.

The existence of institutional repositories and digital libraries affects course management systems. Why should a course management system support its own document library when there is already a library on campus, and how should course management systems take advantage of and offer services to institutional repositories and digital libraries? In addition, the deeper questions with which institutional repositories and digital libraries are now grappling—questions about preservable and interoperable formats, rights documentation and management, sustainable economic models, and standards for describing instructional content—are equally relevant to course management systems.

### New Competitors

It might seem at times that the course management system market is limited when, in fact, there are many vendors in the United States and elsewhere. Some course management system companies have grown up closely attuned to learning objects, component architectures, and other approaches. Many more focus on products that provide specialized functionality, such as online quizzing, bulletin boards, grade books, and document management. Corporate learning management systems to date have not been of great interest to the academy because many of the processes these corporate systems support are the equivalent of student administration systems. Nevertheless, corporate course management systems do include learning content, which is what academic course management systems provide. Corporate and other developments may offer new options.

## Key Questions to Ask

- What, if any, course management technologies are being used on campus?
- What framework should be used to evaluate new technologies?
- Are these technologies integrated into the campus administrative system infrastructure?
- What benefits should be obtained?
- Which features of these technologies truly support teaching and learning?
- Do these technologies support effective and efficient learning?

- What are the costs—the real ones?
- Which newer technologies might be available for supporting teaching and learning?
- Who should be involved in evaluating course management technologies?

## Where to Learn More

- Brandeis University, Project CMS@WBW.edu, <http://web.brandeis.edu/pages/view/Instructional/WBWInfo>.
- C. Carmean and J. Haefner, "Next-Generation Course Management Systems," *EDUCAUSE Quarterly*, Vol. 26, No. 1, 2003, pp. 10–13, <http://www.educause.edu/asp/doclib/abstract.asp?ID=EQM0311>.
- Edutools Course Management Systems, <http://www.edutools.info/course/index.jsp>.
- M. E. Halloran, "Selecting Course Management Software to Meet the Requirements of Faculty and Students," EDUCAUSE Center for Applied Research, Research Bulletin Vol. 2002, Issue 8, April 16, 2002, <http://www.educause.edu/asp/doclib/abstract.asp?ID=ERB0208>.

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## Endnotes

1. K. C. Green, "The 13th National Survey of Computing and Information Technology in American Higher Education" (Encino, Calif.: Campus Computing, December 2002), <http://www.campuscomputing.net/>.
2. C. Carmean and J. Haefner, "Next-Generation Course Management Systems," *EDUCAUSE Quarterly*, Vol. 26, No. 1, 2003, pp. 10–13, <http://www.educause.edu/asp/doclib/abstract.asp?ID=EQM0311>.
3. K. C. Green, "Tracking the Progress of Portals and Web Services," EDUCAUSE Center for Applied Research, Research Bulletin Vol. 2003, Issue 8, April 15, 2003, <http://www.educause.edu/asp/doclib/abstract.asp?ID=ERB0308>.
4. D. Cohen, "Course-Management Software: Where's the Library?" *EDUCAUSE Review* , Vol. 37, No. 2, 2002, pp. 12–13, <http://www.educause.edu/ir/library/pdf/ERM0239.pdf>. This reports how the library community is lobbying for more involvement in course management technology.
5. Edutools Course Management Systems, <http://www.edutools.info/course/index.jsp>.
6. Brandeis University, Project CMS@WBW.edu, <http://web.brandeis.edu/pages/view/Instructional/WBWInfo>.

7. M. E. Halloran, "Selecting Course Management Software to Meet the Requirements of Faculty and Students," EDUCAUSE Center for Applied Research, Research Bulletin Vol. 2002, Issue 8, April 16, 2002, <http://www.educause.edu/asp/doclib/abstract.asp?ID=ERB0208>.
8. Edutools, op. cit.
9. Halloran, op. cit.
10. D. Woolley, "Think of It—a Web Site Devoted to Web Conferencing," <http://www.thinkofit.com/webconf/>.
11. An example of public domain collaborative environment is the Collaborative Virtual Workspace, developed by the MITRE Corporation, available at <http://cvw.sourceforge.net/>.
12. Specifications and standards such as those being developed by the IMS Global Learning Consortium <http://www.imsglobal.org/> and the IEEE Learning Technology Standards Committee <http://ltsc.ieee.org/> allow content to be exchanged among learning platforms and components of learning platforms to exchange data in standardized ways. Web services and similar approaches, such as that being pursued by the Open Knowledge Initiative <http://web.mit.edu/oki/>, will provide even more support for component architectures.
13. Publicly traded companies Centra, Docent Inc., and Saba Software reported that service revenues were 52.19%, 47.15%, and 50.95%, respectively, of total revenues over the last 12 months for which SEC 10K filings were available at the time of this writing.
14. Good examples of learning object projects include EduSource <http://www.edusource.ca/> in Canada, ARIADNE in Europe <http://www.ariadne-eu.org/>, the COLIS demonstrator project in Australia <http://www.colis.mq.edu.au/projects.htm>, and the Wisconsin Online Learning Resource Center in the United States <http://www.wisc-online.com/index.htm>.
15. See <http://ia.usu.edu/>.
16. The Advanced Distributed Learning Initiative's Sharable Content Object Reference Model (SCORM) is of particular note in the instantiation of learning objects. So is metadata. Metadata focuses on cataloging, searching, and discovering learning objects.
17. C. A. Lynch, "Institutional Repositories: Essential Infrastructure for Scholarship in the Digital Age." *ARL Bimonthly Report 226*, February 2003, <http://www.arl.org/newsltr/226/ir.html>.

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