The New Landscape for Course Management Systems

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Overview

The course management systems used in higher education have reached an important juncture in their evolutionary life cycle. With e-learning becoming integral to the curriculum in many colleges and universities, the scope and functionality underlying course management systems are maturing to reflect the demands of the growing user base of professors, administrators, and students. In some institutions, course management systems are so integrated with the core mission that they have achieved the status of an “enterprise” system, on a par with the student, finance, and human resources systems. As the demands placed on these systems have become greater, the course management system (CMS) has evolved to include advanced teaching tools and administrative and management functionality that can be integrated with a variety of campus systems and applications.

The CMS platforms of today have as their genesis faculty teaching tools. Many of the commercial and institution-specific platforms in use today were born in the early to mid-1990s, when individual faculty members, instructional technology programs, and information technology units created basic software platforms to deliver courses online. In the mid-1990s many of these early technologies provided a launching point for commercial CMS vendors.¹ At the same time these products were being adopted at thousands of colleges and universities across the United States and worldwide, early efforts toward providing supplemental online resources for on-campus courses as well as experiments in Web-based distance learning were beginning. As reported in the 2002 Campus Computing Project, the percentage of courses that utilize a CMS tool has risen from 14.7 percent in 2000 to 26.5 percent in 2002.²

With the number of courses that are conducted either wholly or partially online growing very quickly, the role of the CMS in higher education has become strategic. Indeed, the EDUCAUSE 2002 survey of current information technology issues³ reported that distance education and teaching and learning strategies each rank among the top 10 issues in terms of “need to resolve for the institution’s strategic success” and of “potential to become more significant.” Distance education and electronic classrooms and technology buildings also rank among the top 10 issues for the question of “expenditure of most institutional resources.” Almost half (47.5 percent) of the institutions surveyed as part of the Campus Computing Project reported having a strategic plan for CMS deployment.

Future course management systems will be forged within this context of strategic significance. This Research Bulletin highlights and offers a perspective on how the CMS landscape is likely to evolve along key themes, enabling institutions to make better strategic decisions about course management systems.
Highlights of Evolving Course Management System Platforms

The fact that course management systems are in transition from the early stages of their evolution presents a number of interesting issues for consideration by college and university decision makers. The key issues that will shape the future landscape of the CMS marketplace can be viewed along two axes:

- issues related to the technology architecture of the CMS and its associated applications, and
- issues of concern to users of the system.

Among technology architecture issues driven by the vendors and institutions participating in the CMS marketplace are the closely related concerns of integration with other systems and the role of standards and open architecture. Key user-related themes include the concept of learning objects, the extension of administrative tools beyond the course, and technology and support services.

Need for Integration Grows and Moves Toward “Plug and Play”

Since the arrival of commercially available CMS platforms, integration between these platforms and other university systems—including enterprise resource planning (ERP) systems (financial, human resources, and student information), institution-wide portals, authentication systems, and library systems—has been of critical importance. With so many reports, articles, conference discussions, and other communications dedicated to the topic of integration, an observer might wonder if the issue is being overhyped.

Conversations with college and university administrators, CMS vendors, and others, however, reveal that integration is more important than ever as course management systems extend their reach across campus. As more systems become linked to the CMS for automatically populating the CMS course enrollment lists with data from the student information system, or for using data from the CMS for course evaluation and accreditation purposes, these systems must be able to exchange data effectively and predictably to one another. This critical integration has been costly for many institutions, which find themselves allocating high-level IT staff or employing consultants, developers, and systems integrators to tie their systems together.

To date, many vendors in the CMS marketplace and in the software markets that integrate with course management systems (such as portal, assessment, and ERP) have focused on integrating or creating compatibility between software platforms, through partnership and co-development arrangements. That is, CMS vendors have formed alliances with ERP, portal, assessment, and other software providers to achieve compatibility across products. These collaborations are ongoing, and it is expected that they will result in the development of standard interfaces that will make applications work together. Because of the many enterprise software systems in use in higher education, major vendors realize that solutions to the integration problems are based in
standardizing the code sets that allow the applications to communicate rather than in developing proprietary linkages between a given CMS and the specific applications with which it must integrate.

Moving forward from that reality, many CMS vendors are taking more of a “plug and play” approach to integration, by publishing the integration “frameworks” or technical templates and standards for communication between their systems and others. While these vendor integration frameworks remain somewhat proprietary in nature, increasingly vendors and their institutional customers are working with standards bodies to align their systems. With standards at the core of the integration frameworks, the all-important goal of integration should theoretically be achieved at a lower cost and with greater ease.

**Role of Standards and Open, Flexible Architecture**

As we all begin to better understand the potential impacts of online learning, faculty members, developers, college and university administrators, and industry experts alike acknowledge that interoperability, accessibility, and reusability of Web-based content are primary goals. In the rush to find answers to the challenges of integration and standardization, several groups with similar goals have emerged. The most well-known efforts are being undertaken by the IMS Global Learning Consortium, which is responsible for the IMS specifications; the Advanced Distributed Learning group, which introduced the Sharable Content Object Reference Model; and the Massachusetts Institute of Technology Open Knowledge Initiative (OKI), which is defining an architecture that specifies how the components of a learning technology environment communicate with each other and with other campus systems. Another major effort in the e-learning space is being undertaken by the Schools Interoperability Framework, an initiative driven by K–12 education technology providers and users to revolutionize the management and accessibility of data within schools and school districts.

CMS vendors have been quick to express support and compliance for various standards, although in some instances their compliance remains only partial. In the future, as standards bodies launch compliance-testing programs and issue “stamps of approval” indicating compliance, purchasers of course management systems will be able to select systems based on support for standards that help enhance interoperability, compatibility, and the transport of content within and among systems.

Some institutions have made it clear that the ideal CMS will allow them to adopt a best-of-breed approach, whereby they can easily “plug in” to their CMS the specific tools and practices that they prefer. For example, an administrator might wish to replace the threaded discussion component or the gradebook tool of the CMS with alternate tools, either homegrown or vendor-supplied. In seeking to preserve choice, flexibility, and cost efficiency, the modular, best-of-breed approach is favorable to the highly integrated approach, which can result in high costs when the CMS is upgraded or replaced.

Achieving a modular, component-based approach to CMS platforms is only possible through functioning standards that ensure compatibility among systems, components,
and communication protocols. To date, it has been very difficult for standards bodies, vendors, and institutions to agree on these standards.

**Open Knowledge Initiative**

In the search for a standards-based “open architecture,” one initiative of growing import is OKI, a coalition program headquartered at the Massachusetts Institute of Technology with initial funding from the Mellon Foundation. Additional key participants in OKI include Stanford University, the University of Michigan, Dartmouth College, North Carolina State University, the University of Pennsylvania, the University of Wisconsin–Madison, Indiana University, and the University of Cambridge. While first viewed as a potential open-source competitor to commercially available CMS platforms, OKI now has CMS vendors and institutions increasingly rallying around its purpose, articulated as follows:

The Open Knowledge Initiative (OKI) is defining an open and extensible architecture for learning technology specifically targeted to the needs of the higher education community. OKI provides detailed specifications for interfaces among components of a learning management environment, and open source examples of how these interfaces work. The OKI architecture is intended to be used both by commercial product vendors and by higher education product developers. It provides a stable, scalable base that supports the flexibility needed by higher education as learning technology is increasingly integrated into the education process.\(^9\)

More than a standard, OKI is notable because of its bold objective of providing an architecture or framework that includes tightly defined interfaces that will allow institutions to take advantage of best-of-breed modules and components within CMS and related technologies. Clearly, the momentum behind OKI illustrates the desire for this type of architecture, driven by evolving user needs. It is important to remember that these objectives have not yet been achieved—they are targeted milestones for an open architecture that ultimately will change the landscape of course management systems.

**Rise of Learning Objects**

The concept of learning objects has become an increasingly popular topic of discussion among CMS users and vendors in recent years, and it has the potential to shape the future of course management systems. While an academic debate continues over the definition of a learning object, it is generally agreed that a learning object is a small unit of stand-alone learning content that is reusable and tagged with a description (or metadata, defined as data about data) indicating what the object is and allowing it to be easily retrieved in a search.\(^10\) That is, learning objects represent units of learning materials and content smaller than the course.

Learning objects can be text, presentations, quizzes, simulations, video clips, tutorials, animations, photographs, maps, or assessments.\(^11\) An animation of a scientific process is an example of a learning object. In an Introduction to Physics course, a professor might want to incorporate an animation of thermal energy or vibrations and waves. This animation would be accompanied by—that constituting a learning object—explanatory text and other relevant information, and perhaps even an assessment related to the
concepts that the animation illustrates. If the animation, the text, and the assessment all reside in a repository, one professor can use them in the Introduction to Physics course and another professor could use them (or some of them) in a different course.

The digital learning-object concept is important, if not revolutionary, because it allows institutions and faculty members to share and distribute pieces of online course content that would reside in the CMS-of-the-future “object library.” For example, certain core content materials would need to be created only once and referenced thereafter from a database. In this model, adjunct faculty would be more easily empowered to teach courses compiled from the learning objects of others, much in the same way that different sections of a course might revolve around a shared textbook or syllabus. Additionally, as publisher-provided digital content—such as textbook-related course materials and resources—becomes increasingly available in a learning-object format, opportunities emerge for increased quality and efficiency in constructing rich online courses from a digital learning-object library within the CMS.12

Of course, one key in making the learning-object concept more of a reality—Institutions such as the University of Wisconsin13 and the University of Alberta14 are actively creating learning-object policies and digital content repositories—is the recognition that learning objects are predicated on having a set of common standards. The Multimedia Educational Resource for Learning and Online Teaching (MERLOT) is a consortium actively devoted to developing a content repository and championing standards for learning objects.15 In addition, an important part of the IMS standard is its metadata specification.

Another important driver in the development of learning objects is the focus on learning objects of CMS vendors, as well as their support for this type of content functionality and for more generic standards-based frameworks. Institutions are increasingly demanding advanced content-management capabilities within the CMS, capabilities that will allow for the reuse, sharing, and transfer of content within, among, and beyond courses. The next year or two will be formative if this concept is to gain hold within the broader educational community.

**Extension of Administrative Tools Beyond the Course**

Along with the goal of managing learning content beyond the course comes the desire for administrative tools that extend beyond the course. Today’s CMS platforms offer administrative tools for basic reporting on student learning and course utilization, typically within the framework of one course. Tomorrow’s CMS platforms must be able to manage data beyond the course and aggregate course data across the institution. Achieving this goal will involve advanced capabilities for data mining, reporting, and evaluations.

It is interesting to note that many CMS vendors are stratifying along the lines of what they perceive to be academic versus administrative functionality in their product vision—that is, they have increasingly different notions of what a CMS is. Some platforms focus on academics and offer robust, course-focused, content-management tools in a best-of-breed approach, while others focus on technology administration.
While vendor visions differ, it is clear that the notion of what a CMS traditionally has been—software that enables the development, delivery, and administration of Web-based courses and academic resources—is evolving to include additional administrative tools and functionality. Indeed, some have suggested that the name “course management system” inappropriately denotes a system that manages courses, whereas the systems themselves have historically focused more on the management of academic and learning elements than on the course process (for example, scheduling, grading, and testing). For this reason, there is a trend toward referring to the CMS as a “learning management system,” or LMS, instead.

An important determinant in what the CMS will include in the future is where the CMS platform will ultimately fit in relation to the systems with which it integrates. In certain areas, ERP software vendors have extended their student information systems to interact or overlap with the more administrative capabilities of a CMS. However, as course management systems increasingly take on an enterprise scope and function—purchased and used by entire institutions rather than by individual faculty and departments—some of these administrative capabilities may converge.

### Importance of Broader Technologies and Support Services

An often overlooked area with regard to CMS adoption and effective practices is that of technology and support services. These services include the host of technologies (servers, databases, and so on) that a CMS depends upon, as well as the support services, such as faculty training, that are necessary for a CMS to work effectively. A key finding of Eduventures’s September 2002 report, *Distance Learning at the Tipping Point*, was that, as the need for integration reveals, institutions should consider the technology and services related to the CMS holistically.

As institutions scale their use of a CMS, and as the CMS influences more technology systems, departments, offices, and policies, institutions must also scale their underlying technology architecture and capacity to support faculty in developing courses and managing technology. To some extent, this need is being addressed by CMS vendor offerings that now include enterprise portal applications, software hosting services, and faculty support.

The question remains as to whether the inclusion of these additional elements provides a solution that delivers a higher-quality online course experience. Institutions will increasingly face decisions about whether to choose these systems and services from a single vendor offering a suite of products (an integrated approach) or to pursue a best-of-breed strategy, in which the CMS platform, various course tools, portal technologies, and hosting might come from different vendors and might even be combined with in-house development efforts.

### What It Means to Higher Education

As CMS platforms continue to evolve, institutions should formulate or update their CMS strategies in light of the directions described in this bulletin. As course management systems play a greater strategic role in learning and teaching, resources allocated to
these systems are likely to expand. CMS decisions should be examined holistically and enterprise-wide rather than within individual schools or departments of the institution. Choices about course management systems should be made collaboratively among faculty members and academic leaders, instructional technologists, information technologists, and, ideally, students. With a top-down, high-level strategy, institutions can identify opportunities for innovation and efficiency in online learning that the new systems might bring, paying careful attention to the limitations and challenges of today’s systems and creating a plan to address them.

As the idea behind learning objects and repositories such as MERLOT illustrate, the true potential of online learning is beginning to be understood and explored. Additionally, the features and functionality of CMS platforms are increasingly being driven by vendors that work closely with the thought leaders of higher education and the organizations described in this bulletin. The vendors learn from their needs, innovations, and challenges, and then share their best practices with other institutions through the framework that their technology provides. As these systems grow in complexity and scope, CMS strategies must be updated to reflect and anticipate the impact of evolving standards while paying attention to lessons learned from other institutions. The dirt roads on which course management systems have been traveling are being paved, and the landscape is indeed changing.

**Key Questions to Ask**

- Where along the adoption curve is our institution in applying technology strategically to teaching and learning? How many fully online courses do we offer? How many face-to-face courses incorporate the use of a CMS? How many (or what percentage of) faculty members are using course management systems on campus?
- What is our institution’s approach to integration between CMS and other systems on campus?
- Does our institution monitor, participate in, or have a position on standards initiatives? Do we have a policy for standards compliance? Which standards does our CMS vendor support?
- Has our institution investigated having a repository of learning objects or begun an initiative to compile them?
- What is our CMS vendor’s technology vision? Is it aligned to our vision for supporting teaching and learning through technology and the administration of online courses?
- Is our institution’s CMS selection and strategy driven more by course-focused academic capabilities and pedagogy of the platform, or by the need for administrative capabilities, reporting tools, and broader services?
Has our institution considered the scope of CMS-related technologies and services, such as portals, hosting, integration, and faculty support in our strategic planning? Do we share the vision of a best-of-breed CMS, where we can plug in the tools and applications that we prefer into a broad, compatible technology architecture?

Where to Learn More


Endnotes

5. See <http://www.adlnet.org/>.


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