Strategic Directives for Learning Management System Planning

Brandon White, Brandeis University
Johann Ari Larusson, Brandeis University
Overview

A learning management system (LMS) is an online, digital environment that allows information to be shared between students and faculty and provides access to content and administrative features for specific courses. The benefits of the LMS are twofold. First, by distributing materials electronically and nearly instantaneously, an LMS facilitates the creation and dissemination of course materials that otherwise would need to be dispensed during class time. An LMS also allows for the creation of unique learning environments that can supplement in-class activities, empowering both students and instructors to reinforce the course material and to engage with the material in a variety of ways.1

At this point in the development of LMS technologies, it remains less clear, however, just what the comprehensive benefits of an LMS might be, how these benefits can be measured, and what a completely successful implementation of an LMS would look like. Nevertheless, the use of such systems is nearly ubiquitous, and colleges and universities support them for both their pedagogical and administrative benefits.2 At the extremes, the LMS might be considered simply an instructional learning tool, as commonplace as chalk, or it might be the harbinger of pedagogical benefits that fundamentally alter the way teachers teach and learners learn. Presumably, if all parties can be made aware of how LMSs can impact teaching and learning, the benefits can be maximally refocused and refined.

A host of theoretical and practical papers have sought to explore individual components of LMS behavior. This research bulletin reviews these publications in order to isolate the primary claims, functions, and implementations of LMS technology. Most generally, these capabilities can be divided among three broad categories: transmission, which aids in distributing and accessing course material; evaluation, which aids in identifying different learning patterns for students and educators; and interaction, which establishes unique learning environments for the applied practice of specific exercises. By assessing the utility of an LMS to accomplishing these three tasks, this bulletin presents nine directives that can assist in strategic planning for future LMS applications and beyond.

Highlights

LMS tools provide features that cater to the needs of instructors as well as students. Like other important software innovations that have stood the test of time, LMSs (also referred to as course management systems or virtual learning environments) were conceived and developed by faculty—most notably Murray Goldberg at the University of British Columbia (WebCT)—and students, including Dan Cane under two Cornell University economics faculty, Cindy van Es and Deb Streeter (Blackboard). As a measure of the profound impact of the LMS in higher education, this innovation was recognized in 2006 with the inaugural Catalyst Award from EDUCAUSE (see http://www.educause.edu/2006EDUCAUSECatalystAward). Research suggests that individual learners are the perceived end user for LMS development, even though they are not the first (or even second) parties to touch the software.3 Indeed, the most directly impacted subset of users are generally the most vital stakeholders for any kind of
software, and thus their opinions ought to be especially valued. Generally, there remains a conviction that advancing the educational practices of instructors can improve the actual implementation of the technology and thus the learning experience of students. Regardless of which population benefits, there is a trickle-down effect that improves the overall learning experience for both parties.

Within this broader context, most individual LMS implementations aspire to facilitate one of the three priorities that can engage instructors and learners: transmission, evaluation, and interaction.

**Transmission**

Usage patterns and self-reports by educators almost universally demonstrate that the LMS is most frequently used for the transmission of the lecture notes, slides, or course handouts that instructors typically distribute to students in class. As such, the marshalling of an LMS for the purpose of transmission is the feature most analogous to “unplugged” pedagogical practice. The LMS, however, empowers students to engage with the material at any point in time. Thus educators have an opportunity to refine, update, and augment the materials not only before a given class has begun but also during and after, reinforcing curricular goals during each of these periods.

An LMS framework can allow instructors to introduce additional experiments that they might not have had time to cover during the normal period of instruction. In one demonstration, students in a physics class were provided with virtual simulations of experiments that they’d already performed in class through a plug-in for the Moodle LMS. By recreating the class experience, students were able not only to mimic their live experience but also to modify variables at will, thereby testing their knowledge of how the models in question worked or pushing the boundaries of the models to see where they failed. Such utility is even more comprehensive in large courses with multiple instructors, where an LMS helps standardize material across instructors and course sections while providing enough flexibility for each instructor to provide his or her own additional reference materials and tailoring the course for the varied learning styles of students.

LMSs are not, however, a panacea. Studies note that LMSs tend to be used overwhelmingly for their utility as online repositories for syllabi and lectures slides, often neglecting most, if not all, of the remaining features. Without sustained reflection by instructors on how additional features might improve the online learning experience, such limited use is perhaps wasted. Despite looming concerns among educators that the availability of lecture notes and other materials over an LMS might discourage course attendance, at least one study suggests that most LMS activity took place just prior to the specific course meetings, suggesting that LMS use acts as a gateway to, rather than a substitute for, course activities.

**Evaluation**

One of the benefits of the LMS is that it provides users with a built-in opportunity to reflect critically on the utility of the LMS to their teaching or learning. Most LMSs come preconfigured with some kind of analytic software, which allows faculty to track which students have visited the LMS domain, how often, and which materials they’ve
accessed. This can help instructors monitor not only what students are doing on the LMS but also how they’re doing it, what difficulties they’re encountering, and how this information relates, transparently, to that of their peers.14

A potential caveat to this approach, however, is the suggestion that even highly sensitive usage statistics can make it difficult for instructors to distinguish between the individual learning styles of their students.15 As such, much research into the evaluative capacity of LMSs lies in isolating what the correct areas for evaluation are.

Specific benchmarks aside, the most comprehensive method of evaluation is that which directly supports learning during any point in a student’s development. In one study,16 a course employed LMS software to conduct peer reviews of teaching conferences for writing strategies. By seeing others proceed through the exercise, students were first able to review the earlier (knowledge provision) stage of their instruction. In commenting upon it, students were compelled to reflect critically on what they had learned as it applied to a real-world example. Finally, because they were being critiqued themselves, students were asked to put their knowledge into practice.

Although “evaluation” in this sense refers to the actual activity that students and instructors are undertaking, LMSs can likewise be deployed as automated evaluative tools.17 By monitoring students’ interactions in an LMS environment, one program was able to construct more efficient groupings for in-class activities.18 This, in effect, is the purpose of all LMS evaluation—to seek out differences in students’ learning styles in order to isolate optimally effective pedagogies. It would follow that one of the most vital components of an LMS is to offer the tools for evaluation of the LMS itself; the evaluative function is what renders LMSs so adaptable.

### Interaction

Regardless of educational philosophy, LMSs can promote learning only to the degree that students interact with them. The most common method of LMS interaction is the online discussion board, a tool that, even historically,19 has shown ample opportunity to foster interaction between students, but the tool itself does not compel students to ask questions of one another. The motivation to use the tool must come from the instructor (as is the most likely case) or from the students themselves.20

Integrating LMS interaction with coursework can be done, however, at an even greater or a smaller scale than the course itself. Whereas most LMSs are structured around the individual course sections that students happen to be enrolled in, with the instructor of each course responsible for maintaining content, separate studies have attempted to work with smaller groups of users via mobile devices.21 In these cases, the software monitors which students are connected to a wireless network and connects them with other students who are engaged in similar activities. The utility of such interaction is twofold. On one hand, the software would allow for the formation of ad hoc study groups and could distribute slightly different sample problems to each learner, based on his or her prior learning history. This functionality would amplify each student’s individual strengths and encourage collaborative discussion as a means of problem solving. A separate benefit to a mobile LMS would allow students in, say, a life sciences course to
engage in hands-on experiments and fieldwork where the site of a given lab might depend entirely on the learner’s location as determined by a GPS-enabled device. Both setups would have added utility for universities with large off-campus populations, where students might otherwise have difficulty finding ways to work together.

These results, however admirable, might be atypical in most institutions. From faculty self-reports, many studies have found that the features of any given LMS that allow instructors to create interactive learning activities are the least utilized feature overall.\textsuperscript{22} Although faculty state that their primary motive for using LMSs is to improve pedagogy, studies show that faculty tend to use only those features that transmit information most efficiently.\textsuperscript{23}

Regardless of whether it is presently achieved, interaction provides the most novel sequence of end-user experiences, and it marks the fullest potential for LMSs to introduce teaching and learning strategies that are otherwise inconceivable in the real world. It is important to note that the mechanisms discussed here provide only a cursory view of the possible applications and permutations of what an interactive system might be. Indeed, the versatile capacity for LMSs to apply inventive pedagogies might be considered a metaphor for the LMS itself.

**What It Means to Higher Education**

The landscape of LMS literature outlined thus far comes from a number of sources and researchers who have used the technologies in their own classrooms. LMSs are clearly an established, though not unshakeable, component of educational technology infrastructure. Despite variances in actual interfaces and implementations, a majority of U.S. and European universities now maintain some form of LMS.\textsuperscript{24} Yet the landscape is changing, and it is more important than ever to understand what all of the components of an ideal LMS are designed to accomplish.

**Strategic Directives**

Although the possible range of LMS uses might be limited primarily by the imagination of faculty who use them, in practice the usage trends allow us to develop a set of best practice directives that might be helpful guidelines for colleges and universities. While it remains to be seen if any LMS is capable of delivering on all of the directives, these nine points, in sum, form a comprehensive mandate for LMSs.

1. **Build the system around faculty and student needs.** No matter what the function—transmission, evaluation, or interaction—LMSs, like politicians, must cater to a broad spectrum of constituents. While students are ultimately the final beneficiary of any pedagogical refinement,\textsuperscript{25} educators are more likely to be affected by sudden changes to an LMS platform. Any change that has an impact on the practice of teaching has potential consequences for how students are taught, and thus how they might learn. Any proposed LMS should make an attempt to appeal to the priorities and needs of both faculty and students.
2. **Take advantage of pedagogical adaptability.** LMSs, by design, facilitate a broad array of learning activities and accommodate a variety of teaching styles and pedagogical theories. With appropriate developer or IT support, open-source platforms allow an LMS to be modified. Although a platform such as Blackboard is configured with a host of preinstalled features, its functionality is analogous to that of an actual blackboard: instructors supply whatever content they wish, and they are restricted only by the dimensions of the frame. The LMS thus creates a pedagogical instrument that is, essentially, pedagogically neutral. Rather than allowing themselves to be constrained by an LMS, institutions should push the limits of the software to ensure the greatest amount of flexibility in teaching methodology.

3. **Allow learners to learn for themselves.** Based on the sheer volume of literature that discusses this theory, LMSs seem favorably aligned with the express goals of educational constructivism. Even as an LMS empowers an instructor to experiment with a variety of top-down approaches to managing course material, LMS use can encourage students to provide their own answers for how to best navigate the course. Yet precisely because many LMS features (no matter how adaptable) can only be modified by faculty or administrators, it remains important to acknowledge this potential utility of LMSs, or to design exercises that reward student innovations that improve learning.

4. **Use the open-ended LMS to rethink pedagogy.** Because content is preserved and is accessible at any time, the LMS might be used to augment learning at any point during a student’s instruction. Prudent use of an LMS might thus address how the system itself can contribute to learning before, during, and after the period of conventional course interaction. The three broad types of categories for LMS use—transmission, evaluation, and interaction—might be seen to correspond to the chronological stages of a successful LMS implementation: material is first provided through transmission before the course has begun, evaluation tools tell us how students are learning while the course is in progress, and various interactive features can be accessed outside the classroom once the class session has ended.

5. **Develop hybrid strategies for face-to-face and distance learning.** LMSs are used in every educational environment, either as an auxiliary component of ordinary course work or as an independent means of fostering distance learning where conventional face-to-face communication might be impossible. This allows both instructors and administrators to design courses, platforms, and activities that make maximal use of students’ learning time.

6. **Explore the potential to evaluate more than performance.** Although the most obvious reason for using an LMS is that doing so might improve student performance, there is little agreement on what “improved performance” would entail. Most individual studies of LMS use seek to correlate student use of the LMS with higher scores on exams and course evaluations. Although this emphasis on grades is the priority of many researchers—and, it stands to reason, instructors—it has been suggested that students don’t necessarily use an LMS to attain better grades and don’t see their grades as a function of LMS use. Recent work has found that a task-technology fit evaluation of students’ response to technology revealed only a weak correlation between LMS use...
and grades.\textsuperscript{33} While this does not eliminate a very real connection between the two variables, this test does demonstrate that the achievement of better grades through the use of an LMS is not necessarily the explicit motivation for a majority of students.\textsuperscript{34} At the same time, whereas all the studies cited find different methods of gauging student achievement and satisfaction, the strongest findings correlate student \textit{perceptions} of LMS use with actual outcomes. A number of studies maintain that LMSs are now such a commonplace part of the educational experience that students no longer actually \textit{expect} an LMS to improve their actual learning.\textsuperscript{35} If we do hope to effectively measure students' reactions to LMS software, a simple evaluation of its utility, without attention paid to a specific pedagogical checklist, might no longer be enough.

\textbf{7. Incorporate external learning options.} Since students prioritize ease of use in their LMS interactions, it can be inferred that students use external communications channels more frequently than the channels within the LMS because the external channels are easier to use. By tapping into the already omnipresent network of social networks (from blogs to Facebook to Twitter and so forth), the marshalling of Web 2.0 technologies for pedagogical purposes might provide a more intuitive user experience while also allowing for a degree of user investment, customization, and ownership not possible in most commercial LMS applications.\textsuperscript{36}

\textbf{8. Allow the LMS to be used in ways that aren't bound to the size of the classroom.} LMSs have the benefit of being able to accommodate not only a variety of activities but also a variety of sizes of activities. If an LMS-friendly activity can be applied to a group of 500 students with the same ease that it can be applied to 30, or 7, there is little size constraint to what an LMS can accomplish. In the same way that individualized learning constitutes just a component of a student's learning experiences involving smaller groups or the whole class,\textsuperscript{37} so the "class" itself is just another arbitrary grouping that is part of a range of a student's learning environment. Although most LMS design is formulated among individual courses, with the instructors of these courses maintaining absolute fiat over system content, it might be useful to think of an LMS as being able to accommodate significantly larger or significantly smaller groups of users. LMS activities can be designed and implemented then for the course-based systems that are already in place, but with additional attention paid to the needs of other subdivisions of students. In order to make these changes, however, faculty must understand how to amend the existing systems that the LMS touches. The most effective LMS implementation is grounded in the best possible assortment of already-used tools.\textsuperscript{38} If, as we've seen, instructors spend a majority of their time transmitting or first establishing content, streamlining this process as much as possible is advisable, if only to minimize the amount of labor required for "before class" processes and provide more time for refinement of "in class" exercises.\textsuperscript{39}

\textbf{9. Be ready for the end.} Even while the range of features and systems incorporated into LMSs continues to expand, Web 2.0 technologies are encroaching upon the viability of the LMS in terms of cost, agility, support, and functionality. It remains possible that there might soon be a point where a static LMS itself is no longer needed. The LMS, because of its integration with other major institutional technology systems, has itself become an enterprise-wide system. As such, higher education leaders must closely
monitor the possible tendency for LMSs to contribute only to maintaining the educational status quo. The most radical suggestion for future LMS use would dissolve the commercially enforced “course-based” model of LMS use entirely, allowing for the creation of either larger (departmental) or smaller (study groups) units of LMS access, as the case may require. This ability to cater to context awareness is perhaps the feature most lacking in most LMS products. As noted in a study in which mobile or handheld devices were used to assemble ad hoc study groups, this sort of implementation is entirely possible in ways that don’t necessarily require interaction through an LMS interface.

Summary and Conclusions

LMSs are not only becoming more prominent, but in many institutions their domain is expanding. What’s more, it is becoming easier for instructors and learners to begin to tailor systems to suit their own needs. As learning options begin to include broader definitions than formal courses, and, as collaborative learning takes a firmer hold in higher education, the likelihood that LMSs will evolve or transition remains high. When confronting this future, it is imperative to have a workable set of criteria by which the priorities of an LMS, or any learning environment with or without that name, should be weighed. This, fortunately, is made easier as LMSs themselves encourage users to reflect on their own efficacy.

Key Questions to Ask

- To what degree do our existing LMSs make it possible to embrace all of the directives described in this bulletin?
- Which directives are the easiest to attain by making minimal adjustments to the LMS? What are the possible tradeoffs between emphasizing one directive or another?
- How can the directives articulated here be successfully applied to other educational technology systems?
- How might we determine the appropriate time to migrate the work of LMSs to another platform?

Where to Learn More


Endnotes


9. Ibid.


12. Ioannou and Hannafin, “Course Management Systems.”


20. Ibid.


23. Morgan, Faculty Use of Course Management Systems; and Nijhuis and Collis, “Using a Web-Based Course-Management System, 193.


34. Ibid.
35. Pan, Sivo, Gunter, Cornell, “Students’ Perceived Ease of Use of an eLMS”; Ioannou and Hannafin, “Course Management Systems”; and Hamuy and Galaz, “Information versus Communication”.


38. Shee and Wang, “Multi-Criteria Evaluation.”


40. Mott, “Envisioning the Post-LMS Era.”

41. Chen, Kinshuk, Wei, and Yang, “Designing a Self-Contained Group Area Network.”

About the Authors

At Brandeis University, Brandon White (brandonw@brandeis.edu) is Teaching and Learning Fellow, and Johann Ari Larusson (johann@brandeis.edu) is Online Instruction Environment Specialist.

Citation for This Work


Copyright

Copyright 2010 EDUCAUSE and Brandon White and Johann Ari Larusson. All rights reserved. This ECAR research bulletin is proprietary and intended for use only by subscribers. Reproduction, or distribution of ECAR research bulletins to those not formally affiliated with the subscribing organization, is strictly prohibited unless prior permission is granted by EDUCAUSE and the author.