
Pergamon

Internet and Higher Education
4 (2002) 329–336

THE INTERNET AND HIGHER EDUCATION

The design of an e-learning system Beyond the hype

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Abstract

The impact of the Internet on the development and delivery of training programs is real—analysts forecast that corporate spending on e-learning programs will top US$23 billion by 2004. Although the term "e-learning" has now firmly embedded itself into the global corporate vernacular, most executives find themselves doing little more than scattering people and technologies within training programs at random with the hope that one of these programs will work. First generation e-learning systems tend to focus almost entirely on the management and measurement of training processes. They add little or no value to the learning process. Furthermore, they do not provide any means to support internal content production processes, relying instead on commercial courseware. These "learning management systems" (LMS) were seen to be nothing more than launch pads for third party content that the organization would purchase or outsource. Adding to the confusion has been the roar of hype among a growing number of e-learning providers, whose promises and forecasts have left executives wandering on the e-learning path, without a definite direction. In this paper, the author provides an insight into the different types of e-learning systems that can be developed as well as the tasks and activities necessary to build them. © 2002 Published by Elsevier Science Inc.

Keywords: E-learning; Training; Knowledge management; Learning management systems; Learning design systems

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1096-7516/02/$ – see front matter © 2002 Published by Elsevier Science Inc.
PII: S1096-7516(01)00069-0

1. Introduction

The great majority of organizations have only begun to search for ways to build and maintain ongoing capabilities in e-learning. According to a 1999 study by Mercer Management Consulting (in Sadler, 2001), most companies that are using distributed learning today have maintained the traditional focus on "training" and have not yet expanded their vision to the broader uses and possibilities afforded by e-learning. They found that innovative enterprises have moved beyond training to focus on e-learning in the context of Knowledge Management. These usage patterns will change as four trends emerge:

- The emphasis will shift from "training" to "learning"—from education in preparation for a job to education as a continuing activity within a career.
- The emphasis will continue to shift to "performance support" with the integration of Knowledge Management capabilities. E-learning is a vital step in the development of Knowledge Management Systems.
- E-learning content will expand beyond its current concentration on IT and certification programs and will focus on meeting business needs.
- Internally developed content will become more important than off-the-shelf courseware as e-learning initiatives focus on the goals of the organization.

First generation e-learning systems tend to focus almost entirely on the management and measurement of training processes. They add little or no value to the learning process. Furthermore, they do not provide any means to support internal content production processes, relying instead on commercial courseware. These "Learning Management Systems" (LMS) were seen to be nothing more than launch pads for third party content that the organization would purchase or outsource. The current generation of e-learning products were never designed to help organizations collect, organize, manage, maintain, reuse, and target instructional content.

In developing a training system used by over 50,000 teachers in the United Kingdom (ICCA National Grid for Learning Project, see http://www.icctg.co.uk), we recognized a need to move from creating and delivering large inflexible training courses toward producing database-driven learning objects that can be reused, searched, and modified independent of their delivery media. Authoring tools that are adequate for single user authoring and small-scale development, do not have integrated project management or instructional design capability. These capabilities are essential as the scale and sophistication of learning content development and deployment increases.

2. E-learning strategy

The missing ingredients from most e-learning programs are clear and measurable objectives and cohesive strategies. Before an organization can evaluate any offerings from

an e-learning provider or implement any internal initiative, it must first create a cohesive strategy that clearly defines and documents the value each program must deliver — before any program moves beyond the concept stage. The too-frequently repeated "spray and pray" approach to Web-based training programs does not work in most cases. E-learning strategy should at the minimum address (McGraw, 2001):

- A common language and vision to describe e-learning for the organization and its linkages to business needs.
- Governing principles and organization-wide support policies.
- Creation of content that make learning compelling, engaging, and relevant to target audience needs.
- Support for individual learner profiles, including job- or role-based competencies, interests, and long-term career goals.
- A standards-driven technical architecture that can link to existing systems and be accessed efficiently.

3. E-learning systems framework

The role and importance of technology in the development of e-learning systems is often overstated by technology providers. It is often stated that the deployment of an LMS alone is all it takes to implement e-learning. The problem is, in many cases the development of e-learning projects devolved into a purely technical process, resulting in expensive software implementations, essentially unused by uninformed, fearful, or resentful employees.

Instead, designers should seek to understand the basic components of what constitutes an e-learning "ecosystem." This systems framework is crucial in guiding the decisions relating to the choice and development of each component in relation to the objectives outlined in the organizational e-learning strategy. The framework will specify a learning systems architecture for pedagogical development and systems integration. Learning and the needs associated with supporting learning evolve and change over time, and so should learning systems. The reference architecture provided by a systems framework will allow an organization to progressively select and construct systems depending on requirements and budget.

The following model (Fig. 1) describes one such framework. It is a conceptual model, representing the information flow and linkages between various modules, and the interaction between main processes with the learning value chain. It is based on the Learning Technologies Systems Architecture (Architecture and Reference Model Working Group, IEEE, see http://www.ieee.org) developed by the IEEE and other standards organizations such as Aviation Industry CBT Committee (AICC, see: http://www.aicc.org/), IMS Global Learning Consortium (IMS, see http://www.imsproject.org/), and Advanced Distributed Learning Network (ADL, see http://www.adlnet.org). This frame-

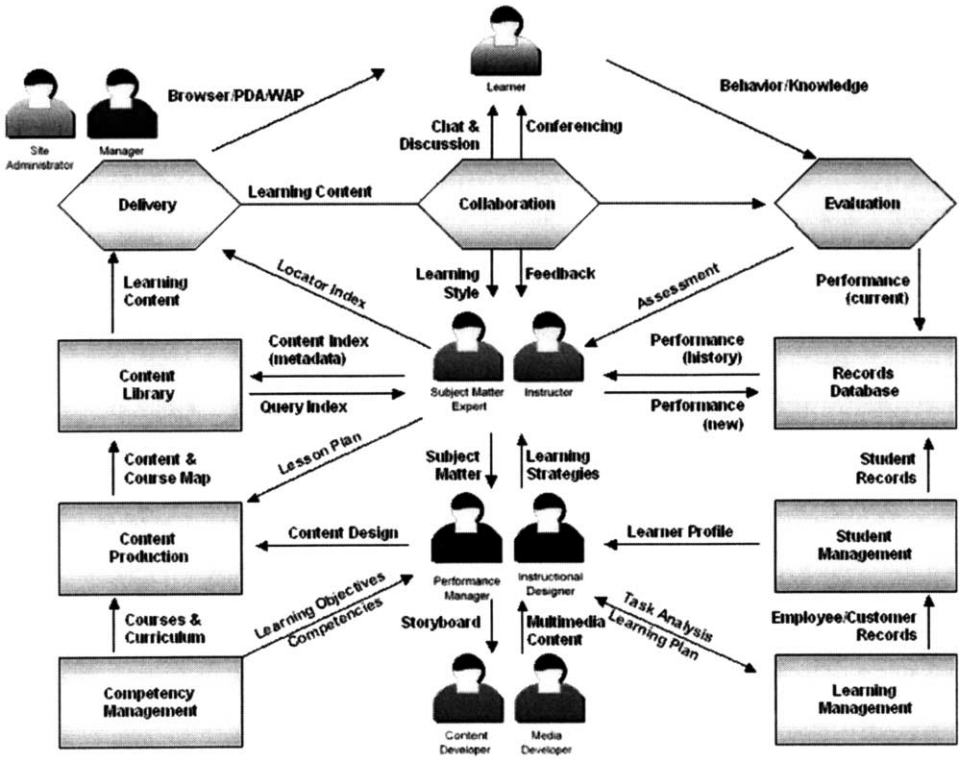

Fig. 1. E-learning systems framework.

work provides a means for organizations to systematically envision and craft their e-learning systems while maintaining interoperability with third party applications and content.

4. E-learning applications

Once the systems framework has been adopted by an organization, the next step is to identify the actual applications that can be developed or acquired. While the industry has been relatively enamored by LMSs, the LMS is based on the notion that content can be purchased. While this may be the case for certain subject matters such as IT training, content required for organizational development and knowledge transfer are unlikely to be found in the catalogs of a third party vendor. Such content needs to be developed to cater for the specific needs or needs to be customized to the language and cultural requirements of an organization.

As can be seen from Fig. 1, the management of learning is but one component of the Learning Systems Framework. The other critical components that can be derived from the framework include a Learning Content Design System, a Learning Content Management

System (LCMS), and finally, a Learning Support System (LSS). The relationship between these applications is illustrated in Fig. 2.

5. Learning design system (LDS)

The main function of an LDS is to allow content producers to quickly analyze and design instructionally sound learning programs. The LDS should also provide a project management capability that incorporates an instructional design methodology of choice. An LDS can used to produce a storyboard and flowchart of the complete structure of the final product. This structure should consist of learning objects that can then be used by content developers to develop instructional materials.

Many e-learning projects do not realize their full potential because they fail to adequately meet basic instructional goals and objectives. In the worst cases, these goals and objectives are never even defined beyond a broad statement of direction. The key to developing effective material lies in combining clear learning goals with pedagogical models. Often this is not done because content developers are not trained in instructional design principles.

One possible solution is to embed instructional design tasks into a project management tool allowing such tasks to be assigned and tracked. This approach enables developers who are not trained in instructional design principles to adopt and follow a good instructional

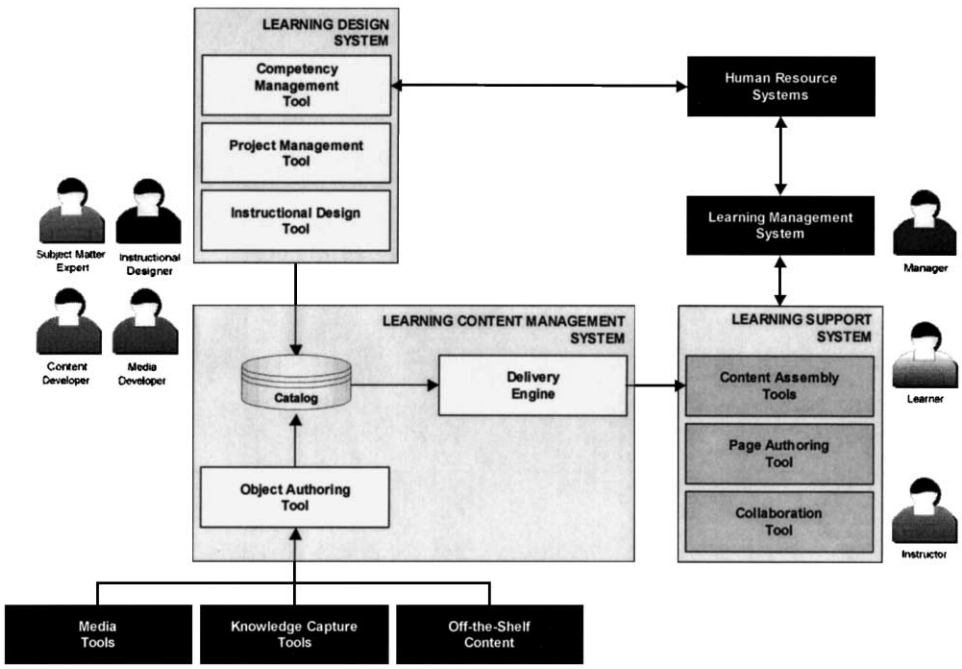

Fig. 2. E-learning applications.

design methodology in producing learning materials. When supplemented by templates, this approach will allow content developers to adequately plan and execute the development of their e-learning project.

6. Learning Content Management System

The primary role of an LCMS is to provide a collaborative authoring environment for creating and maintaining learning content. Within the LCMS, workflow processes can be activated to coordinate collaborative authoring of learning content. Subject Matter Experts and Content Developers use the LCMS to develop content while Media Developers could add interactive materials and multimedia elements. Finally, editors would use the LCMS to review and approve the submitted objects.

Traditionally, a single person, typically the instructor, would have performed such activities. An LCMS provides a structured framework to manage the content development process where more than one person is involved in the development process. If delivered as a web application, content can be created and assembled from multiple remote locations. Revision tracking, task notification, and check-in/check-out facilities provide content developers with a means to collaborate in a systematic manner. The goal of an LCMS is the creation of instructionally effective learning content that is on time and within the budget.

The LCMS bridges the gap between authoring tools and LMSs (Singh, 2001). The LCMS provides the developer with the tools and functionality required to produce and manage effective learning content. The LCMS allows organizations to:

- Capture the knowledge within their organization.
- Structure the knowledge into focused, directed learning programs.
- Incorporate third party content.
- Achieve rapid updates, dissemination, management, and utilization of that knowledge throughout the organization.

7. Learning Support System

An LSS is a web-based environment for supporting teaching and learning activities. From the perspective of an instructor, the LSS is a tool to manage and support a group of learners. The LSS is a tool used by the instructor to design the materials for a course. The syllabus could contain materials assembled from learning objects created in the LCMS and/or pages specifically created in the LSS. The instructor could then use the LSS to plan the delivery of the materials whether through traditional lectures or through online delivery mechanisms. The LSS should provide tracking and usage information to the LMS, using industry standard protocols.

From the perspective of a learner, the LSS provides access to the syllabus as laid out by the instructor. This could take the form of a study plan or a schedule of lectures with links to the

materials in the syllabus. In addition to the learning materials, the LSS should also provide learners with a suite of collaboration tools: threaded discussions, synchronous messaging, and shared whiteboards. The support of LSS for class projects and assignments is essential to facilitate the learning process. A repository for learner-provided materials could be provided to allow learners to share their knowledge. An LSS can also be used to deliver quizzes, tests, surveys, and other forms of assessment.

While most LMSs tend to provide these capabilities, the features implement in the LMS has tended to support self-directed learning. While this is an important mode of online learning, e-learning should be first and foremost about creating a social space that must be managed for the teaching and learning needs of the particular group of people inhabiting that space. This requires a platform that can be easily modified to take into consideration the needs of the particular learners in the course.

E-learning does not imply that all learners will be individually advancing at their own pace, rather, most organizations will tend to provide online learning support to traditional instructor-led programs. Instead of reducing interaction between learners as was originally feared, effective e-learning programs will tend to increase collaboration and communication between learners and instructors. Studies by the OTTER Group (Gilroy, 2001) have shown that the ideal class is organized around the 50/50 rule. At least 50% of the time students spend in the virtual classroom is spent interacting with and learning about other students. When the social aspect of the classroom is missing, student dissatisfaction rises dramatically, as does the attrition rate.

8. Conclusion

The development and management of learning objects is the next step in e-learning. Granular information is essential to the delivery of the right information, to the right person, in the right amount, whether that information is received on a notebook or a PDA. The development of these systems will enable just-in-time learning and the convergence of e-learning with Knowledge Management. Today, many vendors offer products called Learning Management Systems, which they claim provide a complete e-learning solution. However, products in this category do not address the need to develop and manage increasing volumes of content in smaller chunks by a larger group of content providers. Nor do they provide adequate mechanisms for maintaining consistent instructional presentation or adapting that content to the needs of learners. It is thus important for organizations embarking on an e-learning development project to develop a strategy and systems framework prior to any technology acquisition.

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Web resources

Advanced Distributed Learning Network, http://www.adlnet.org/.
Aviation Industry CBT Committee, http://www.aicc.org/.
ICAA National Grid for Learning Project, http://www.icctg.co.uk.
IEEE, Architecture and Reference Model Working Group, http://www.ieee.org.
IMS Global Learning Consortium, http://www.imsproject.org/.