

Technology considerations in the implementation of e-learning

Technology considerations surrounding the delivery of e-learning are substantial and vary significantly depending upon functionality and delivery requirements.

This whitepaper discusses a range of technology considerations that are applicable to any e-learning project implementation, whether you are a university wanting to leverage its courseware in Asia, a small company looking at developing an online learning solution for its staff or a large company implementing a global e-learning solution across its distribution channels.

Software reflects the functionality required

The software utilised in any electronic learning solution depends upon delivery requirements. Issues to consider include:

- **Tailoring** - if the online resources are to be used by multiple organisations will there be a requirement for the content to be tailored or branded differently?
- **Use by instructors** - is there a requirement to allow instructors to add their own content? Software requirements will change depending on the technical skill level of the people needing to access and change courseware elements.
- **Student tracking and administration systems** - will student usage of the online resources, completion of activities and assignments, and submission of answers to assignments be tracked? Will student information be linked with external databases and administration systems?
- **Multimedia tools** - will streaming media (audio/video) be used? Will it be synchronous or asynchronous? Will interactive multimedia be used to illustrate concepts or deliver content?
- **Interactive tools** - the requirement for tools such as discussion boards, white boards, chat, communities of interest, and student homepages will impact the choice of software.
- **Assessment tools** - if summative assessment is to be completed electronically then high security and functionality are required in specialist assessment tools.

Learning Content Management Systems

Learning Content Management Systems (LCMSs) are software platforms designed to assist the creation of e-learning environments. These systems are primarily designed to allow 'subject matter experts' who are inexperienced in programming to create electronic learning environments using basic internet functionality. Accordingly, LCMSs have many advantages, especially in 'authoring intense' environments such as universities. LCMSs also have in-built features such as discussion boards and email. Because LCMSs are designed to simplify the authoring process for inexperienced users, their main disadvantage is that they can prove to be extremely limiting for experienced programmers attempting to

develop 'best of breed' pedagogically designed e-learning content. They also often have limited functionality from a technical ('back end') perspective. We are not currently aware of any single LCMS that supplies optimal functionality without integration with other software products and compatibility issues can introduce further limitations.

Blackboard and WebCT are the most well known LCMSs in the academic market. There are literally hundreds of other platforms competing in the corporate learning market place. The selection of one LCMS necessarily excludes the use of other LCMS platforms unless the content is developed in parallel (at significant cost) within one or more LCMS systems. While the development across multiple LCMS systems is not necessary if there is a single centralised user, it would be necessary if the client wanted to allow 'adoption' (see below) of its content into different organisations.

In pricing their use, LCMS vendors generally charge licence fees based on numbers of users across different organisations. As the expansion of e-learning has become more rapid over the last year, LCMS licensing costs have also risen steeply. Corporate pricing of these systems is significantly more expensive than academic pricing. It is important to note that e-learning resources do not necessarily require the use of a 'brand name' LCMS.

'Centralisation' of e-learning courseware

Once e-learning content has been developed it is generally delivered using one of two technology models: 'Centralisation' or 'Adoption'. The centralised model is often associated with corporate e-learning offerings and the adoption approach with university offerings. Both have advantages and disadvantages.

A centralised approach means that only a single copy of the e-learning materials exists in a single, enterprise strength, data centre. All organisations get the e-learning courseware from this central repository. This does not prevent each organisation from tailoring its own implementation of the e-learning courseware (although it may have to be facilitated by a third party within a version controlled environment). Further, every organisation has separate database structures within the central repository to ensure that its students, teachers, content and results are separately accessible. Each organisation can isolate itself and communicate internally only, or can communicate with all participants in the centralised system. This creates learning communities both within organisations, and potentially across all organisations using the courseware.

A centralised solution provides a superior technical solution for ensuring 'best of breed' software and hardware is utilised to provide a dedicated e-learning environment. A centralised solution also provides the best solution for protecting, managing and updating, and 'version controlling' the intellectual content of the e-learning system.

'Adoption' of e-learning courseware

An adoption approach means that all of the 'files' that make up the e-learning system are provided to every organisation that uses the e-learning system. That organisation is then responsible for uploading the files onto a suitable computer environment, maintaining them, and providing technical support to their users.

The main advantage of an adoption approach is that the adopting organisation can quickly and easily tailor the content for its individual delivery without the use of a third party. Further, the students of that organisation can then use a common software platform that is consistent with all of the other (unrelated)

courses run by that organisation (provided that the LCMS being run is compatible with the files supplied). A drawback of this model is that it is more difficult (but not impossible) for students to form contacts or communication communities with other users of the system in other organisations.

An adoption approach becomes technically more difficult when differing adopting organisations use different software or computer systems. If specialist software is being used to provide quality e-learning solutions, then the adopting organisation will need to own or licence that software as well (or a 'cut down' version of the e-learning courseware would need to be provided for adoption purposes).

If an adoption approach is to be followed, it is likely that multiple versions of the underlying files will need to be developed, maintained and synchronised. Even then, students at different adopting organisations may experience a different level of quality from the same files, depending on the type of the computer systems provided and the other uses which those systems are simultaneously being put to. A strong 'version control' and updating system that allows files to be updated by the master author across multiple sites needs to be in place if this approach is used. A solid legal licensing system that clearly states what data can be altered or tailored by an adopting organisation should be implemented and a system to protect copyrights and intellectual property may be required.

Even if an adoption approach is followed, it is likely that at least one centralised offering will need to be maintained for those organisations who would like to use the material but who do not have the software, hardware or technical expertise to maintain their own adopted copy.

A blended approach: 'Centralised Adoption'

The centralised and adoption models are not mutually exclusive. It is possible to maintain a centralised core of material hosted in a professional enterprise strength data centre and then provide 'adoption packs' for organisations that have their own LCMS. Each 'adoption pack' would contain summaries of the core material tailored to each institution's offering that would allow the institution to populate its LCMS with some relevant content and then link its LCMS into the central core. The institution could then use its own LCMS to tailor any additional requirements it may have for its own course offering including local communication groups and message boards.

Classroom versus Courseware

To begin with an analogy - it is well understood that a 'textbook' is not, itself, a 'course'. A course consists of a syllabus around which many learning tools are collected to assist students to learn. A face-to-face teacher may, or may not, be one of those resources, as may be a textbook.

E-learning resources blur the boundaries between a 'course' and a 'textbook'. It is possible to provide such a huge collection of learning tools within a single e-learning package (including a 'virtual classroom' complete with a real human instructor sitting at their own PC, and a complete syllabus and teaching guide to train that teacher on how to deliver the content) that the e-learning resource becomes a complete 'turn-key' solution for an organisation seeking to deliver a particular syllabus. Taken to extreme, a foreign university could for example 'adopt' an Australian university's e-learning resource, brand the 'front-end' of that resource with its own image and connect the 'back-end' with a teacher/university in Australia who provides the teaching. The Australian

university provides everything for the foreign institution - including the virtual classroom and real teacher - and the overseas university supplies its brand presence, local marketing power and local target markets. Time-to-market and start-up costs for adopting institutions are almost nil.

On the other hand, it is possible to provide a far less ambitious offering in which the e-learning tool is more akin to a textbook - being one of a wide range of learning resource that a foreign institution may use to assist students in completing their studies.

It is important to have a good vision of the required end product before commencing the development process. Each of these e-learning deliveries has materially different strategic opportunities, development cost, time, branding and revenue implications.

Hosting and licensing

In addition to our publishing services, Perdisco is able to supply the software, hardware and communications infrastructure required to provide enterprise strength data solutions for centralised e-learning delivery, both on a local and international level.

Links between Perdisco's servers and the client's website enable seamless connection to the learning materials for the students (such that they do not know they are leaving the client's website to access the course materials). The 'look and feel' of all materials reflects the client's branding.

Perdisco's hardware and communications infrastructure

The delivery of centralised e-learning facilities to large groups of learners requires dedicated communications infrastructure. This includes modern, multiple processor, RAID configured servers with fail-over redundancy, working together with each dedicated to particular tasks such as web serving, applications delivery, database management and multi-media streaming. Perdisco's equipment is hosted in an enterprise grade data centre with:

- firewall protection
- full backup facilities
- managed ambient environment
- uninterruptible power supply with stand-by autonomous generator
- regulated air conditioning
- fire detection and flame repression system
- large redundant internet connections (managed by different carriers) connected directly to the Australian internet backbone.

The communications infrastructure that we provide for any e-learning project is set according to our understanding of the processor, disk access and bandwidth requirements of the e-learning environments being created. To a large part this depends on the total number of users and the number of simultaneous accesses on the site by users. To provide large scale, simultaneous responses (for example, if hundreds of students were sitting a final summative exam at exactly the same time), additional dedicated communications infrastructure can be provided.

Perdisco

Perdisco is an e-learning publisher based in Sydney, Australia. We specialise in developing and publishing adult education resources for business related topics. For more information, please visit www.perdisco.com.au or email info@perdisco.com.au.