"eLMS": The e-Learning Managed Solution: Enabling Learning into the Future

Marcia Harrison

Cranfield University is in the unique position of being able to offer a fully managed service which supports various aspects of online, distributed or blended learning via our "e-Learning Managed Solution" (eLMS).

The development work, conducted on behalf of the MoD and The Defence Academy, has enabled us to develop a range of integrated services and technologies in a coherent framework for product development, learning content and e-learning delivery through a variety of formats.

Our starting point was to address the following requirements:

- The need to quickly re-use and repurpose content across sectors and different programmes.
- The management of modular-based content.
- The need to adopt standards such as Sharable Content Object Reference Model (SCORM), IMS, AICC Dublin Core, etc.
- The need to address the consortium model to enable content sharing across boundaries but that could also protect content.
- Better management of workflows.
- Being an academic institution we wanted to re-instate owner control and avoid technology "lock-in".
- We want to provide durability of learning content and reduce the cost of eLearning.
- We wanted to unlock future potential, e.g. adaptive learning.
- We needed to create and manage a range of metadata strategies for different assets.
- We wanted independence from authoring tools and course delivery systems.

The flexible model we have developed is capable of addressing different e-learning strategies.

We have adopted a four-phased approach:

(1) A scoping phase.
(2) A pilot/prototype phase.
(3) Full development.
(4) Maintenance.

The service we provide offers:

- pedagogic advice by nationally renowned expertise in the field of e-learning;
- instructional design;
- production of learning materials tailored to suit the client's requirements;
- experience of working closely with client's subject matter experts (SMEs);
- project management;
- an integrated project team approach;
- a learning content management system (LCMS) which incorporates: workflows; collaboration tools; version control and copyright controls;
- standards – SCORM, IMS, Dublin Core, etc.;
- quality assurance;
- interoperability with existing in-house systems;
- flexibility of delivery outputs to Web-based systems, VLE, MLE, CD ROM and paper, etc.;
- support officers to assist staff and students;
- a hosted service;
- digital repositories for: learning objects; image banks; question banks, etc.;
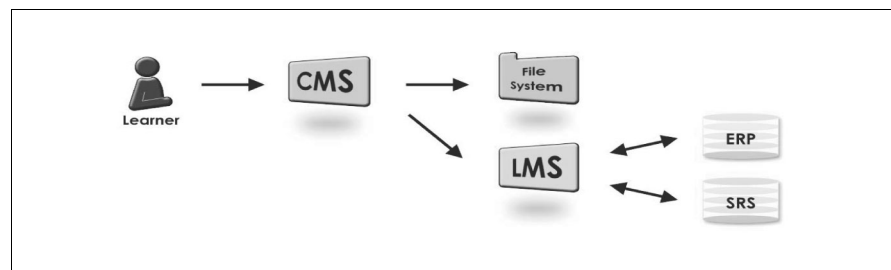- Web design; and
- maintenance.

Evolution of eLearning systems

We have achieved the solution through a gradual evolution and recognition of unsatisfied needs from

Figure 1
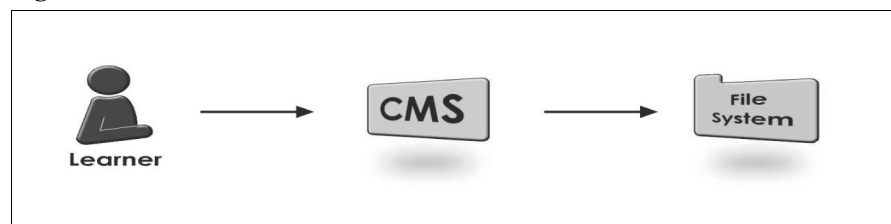
Figure 2

existing technology. We have been constantly growing and changing with the successive generations of technological innovation as they came onto the market but always demanding more of the products, in much the same way as many other institutions.

Evolution of the LMS to the LCMS

Course management systems emerged. These were focussed on delivery of entire courses with no means of managing course content, objects or assets (Figure 1).

Learning management systems developed. The additional management features introduced in this phase meant that tools were capable of doing some rudimentary student tracking. They also integrated at some level with management systems. However, they were usually implemented independently of the learner interface which meant they were still unable to manage course content objects or assets (Figure 2).

Learning CONTENT management systems. LCMS brought the capability of managed repository services and the ability to manage content at the granular level of objects and assets (Figure 3).

Islands of content

Islands of content existed within LMS, and the deployment of an LCMS does not necessarily solve the content issues because they can still be generated within the LCMS (Figure 4).

Islands of content across consortia

An LCMS integrated with the virtual learning environment (VLE) creates the bridge between the data islands of a single institution.

Allowing different permissions to access content, share materials and collaborate where appropriate, managing and identifying various content types and evaluating what content you might want to repurpose or distribute across a number of courses is all part of the bridging process. However, this does not necessarily resolve the sharing or collaborating between institutions (Figures 5 and 6).
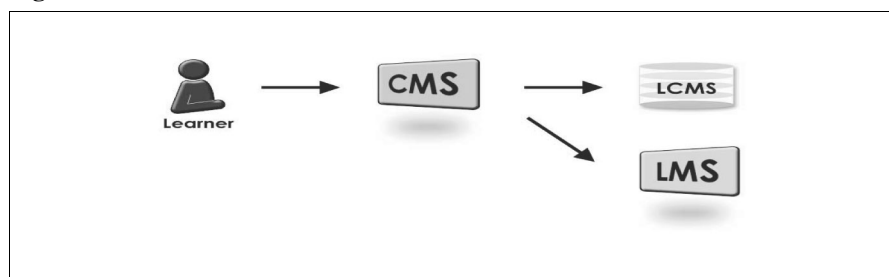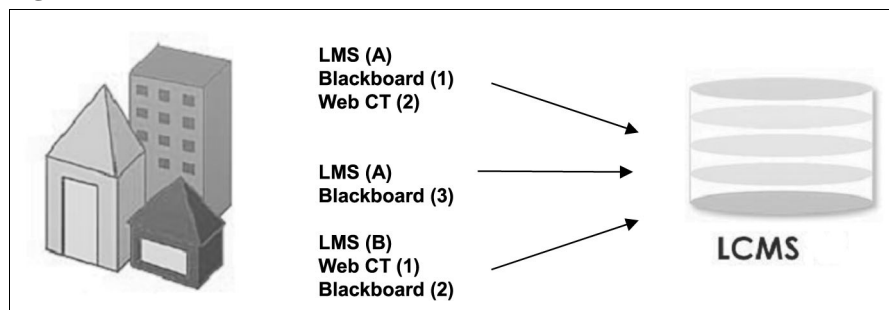
Figure 3
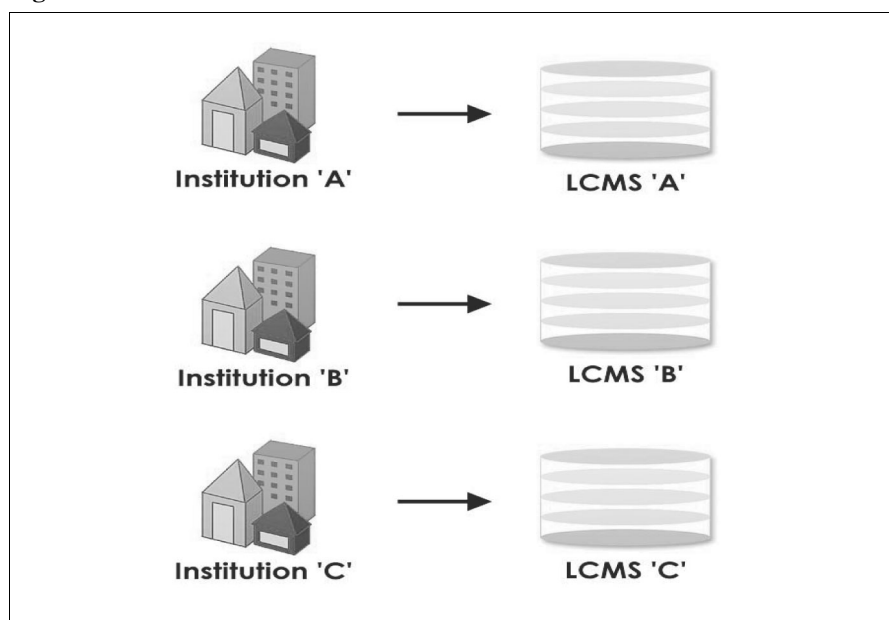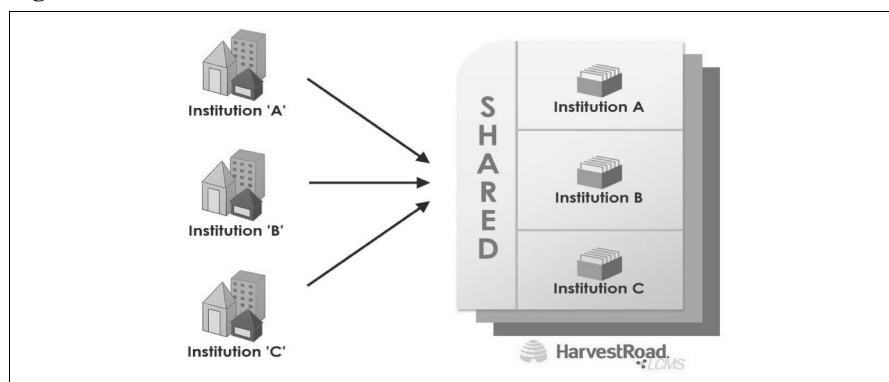

Figure 4

Figure 5

Figure 6

The next step: the federated digital repository

The federated digital repository system provides

- An independent digital repository for any type of object.
- An interface with any LMS or CMS.
- An interface with any authoring tool.
- Collaboration and shared content with delegated control to institutions and permissions of varying degrees.
- Independence from technology or vendor ''lock-in''.
- The ability to deploy a system that can scale to meet demand as it grows (Figure 7).

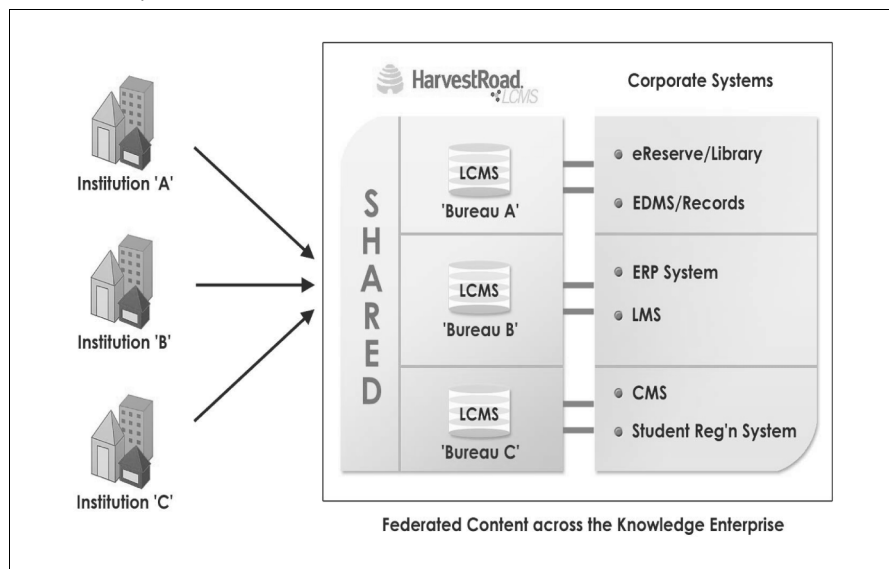## The Harvest Road "HIVE" FDRS system architecture

Value added to the LMS

- Linking islands of content.
- Multiple repository services.
- Workflow management.
- Metadata management.
- Federated searching.
- ePortfolio platform.
- Scalability.
- Bureau capability.
- Version control.
- Portal integration tools.
- Not just an LCMS, but an application integration platform.
- Converts content to other formats so that LMS can serve or link content destined for portable devices.
- Reduce content redundancy.
- No need to change the course in the LMS if the content changes (Figure 8).

Content duplication

Duplication of content items used in multiple course instances creates maintenance and storage problems. The federated digital repository removes content duplication enabling a single instance of content to be dynamically delivered to the LMS. This results in reduced maintenance, reduced duplication and the ability to reuse the whole course manifest or just small components (Figure 9).

Figure 7
The FDRS system architecture

Figure 8
The Harvest Road ''HIVE'' FDRS system architecture
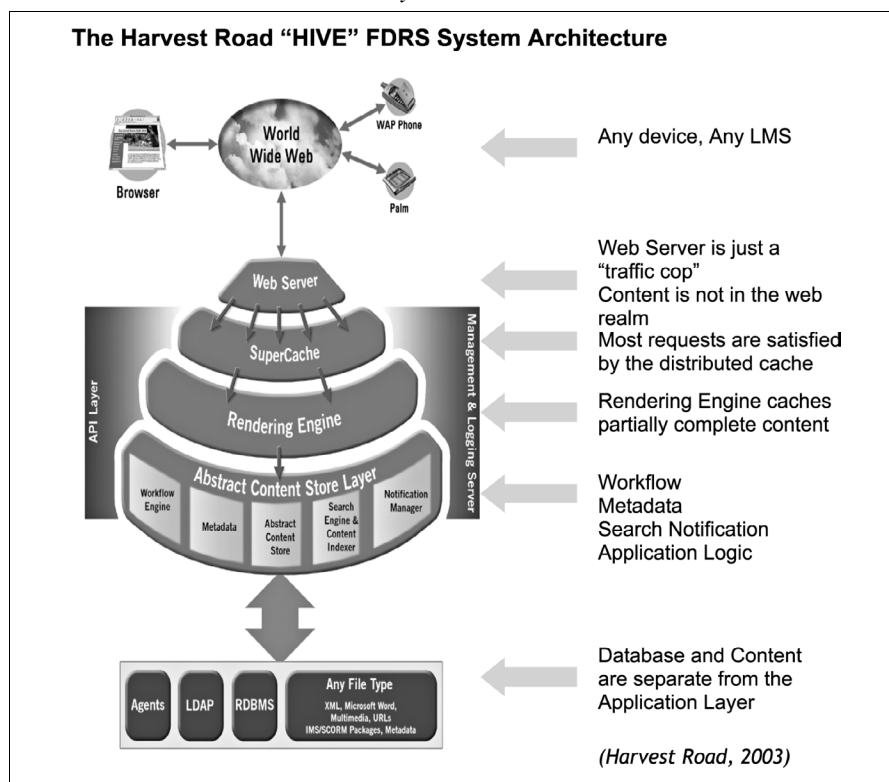
## Same source content: re-purposed and re-branded

The federated digital repository enables course content to be separated from the look and feel of the user interface, enabling content re-purposed and re-branded across courses, institutions or different delivery devices (Figure 10).

Key eLearning requirements

The eLMS solution is built on the Harvest Road ''Hive'' LCMS and now addresses most of the e-learning

Figure 9
Content duplication
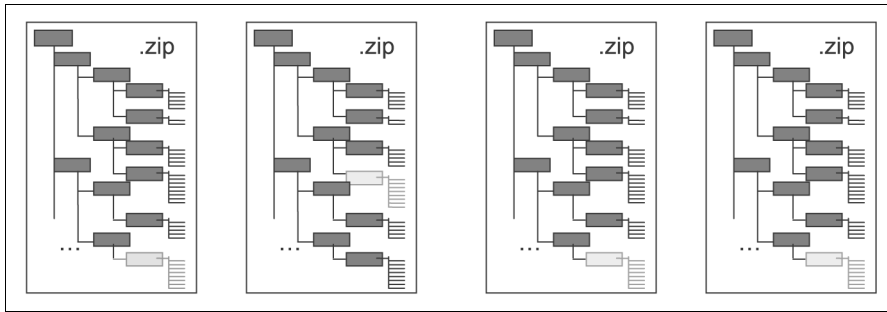
problems we were experiencing on several fronts.

We recognized the need to incorporate the attributes of a content management system but the LCMS goes beyond that by being able to interact and complement existing systems which the university had invested in whilst also building in some future proofing.

In summary

- We can re-use and repurpose content across sectors and programmes.

- We can manage modular-based content.

- Our clients wanted SCORM compliancy, and we recognize that this is the key to interoperability on a large scale. However "Hive" can also deal with other standards such as: IMS; AICC Dublin Core, etc.

- Given our University/Defence Academy structure we needed to look at a consortium model to enable sharing across boundaries but that could also protect content.

- The bureau approach means that we can manage and re-brand content to give a better fit when supporting consortiums and large, distributed institutions whilst still allowing re-use of content across the sectors.

- We can integrate with the variety of client systems and staff tools.

- Given our client base we needed to be able to offer scalability which was an unknown factor because scalability is not actually a "plug-in".

- We needed to think about PDA and alternative technology delivery mechanisms for modern learners.

- We needed collaborative tools for distributed SMEs and authors.

- Given the complexity of the different workflows we also wanted to manage this multi-dimensional problem electronically.

- Being an academic institution we wanted to re-instate owner control and avoid technology "lock-in".

- We want to provide durability of learning content and reduce the cost of eLearning.

Figure 10
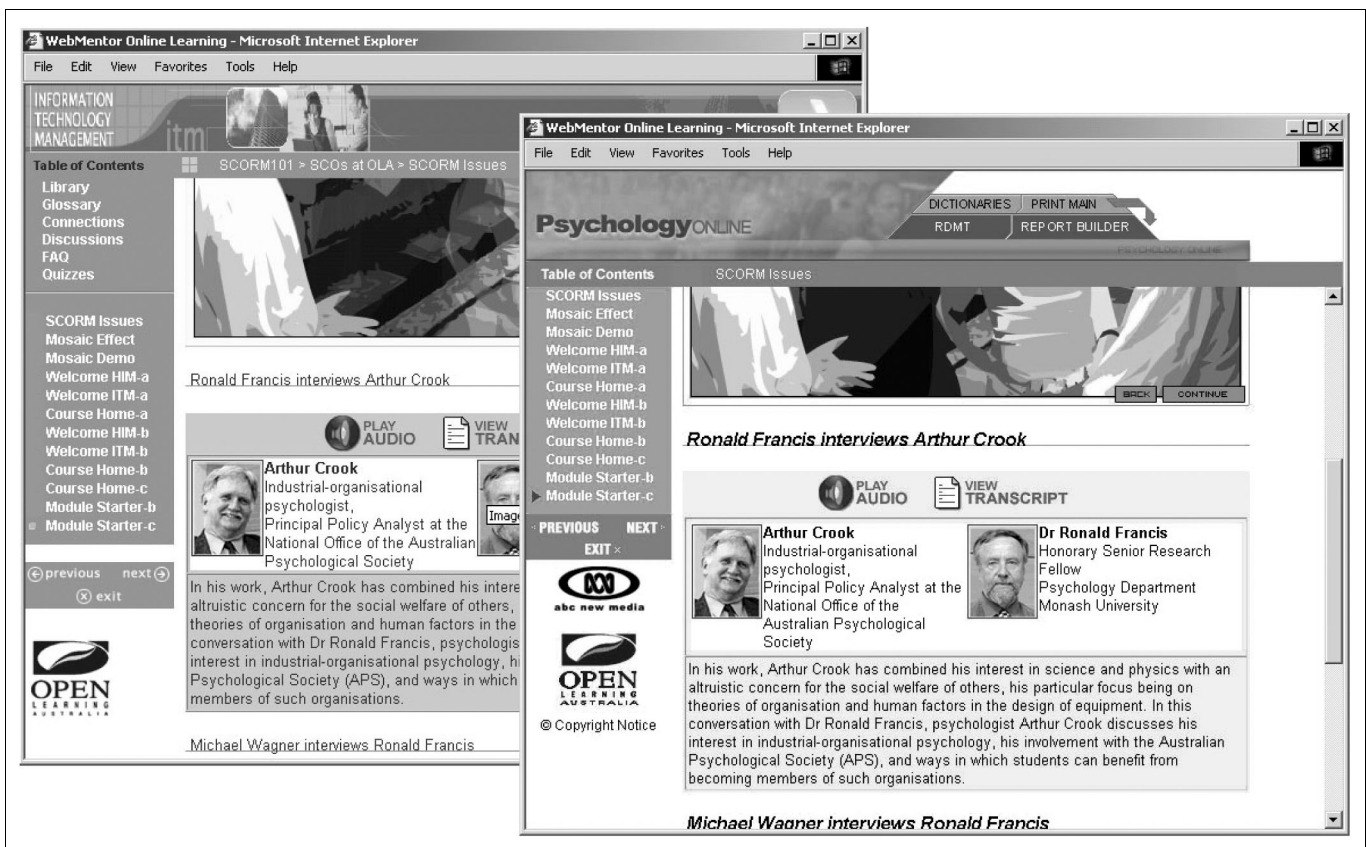
- We wanted to unlock future potential, e.g. adaptive learning.
- We needed to create and manage a range of metadata strategies for different assets.
- We wanted independence from authoring tools and course delivery systems.
- We can build numerous digital object repositories for images, content, doctrine, etc. and apply different metadata strategies and standards.

- Quality assurance and project management tools support our quality management processes.

- We have been able to build a robust infrastructure which supports change.