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AUSTRALIAN *FLEXIBLE LEARNING*

Managed by the Flexible Learning Advisory Group on behalf of all States and Territories in conjunction with ANTA

Strategy 2001

Flexible Learning Fellowship Report Parts 2 and 3

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In August 1999, the Australian National Training Authority Chief Executive Officers (ANTA CEOs) endorsed the *Flexible Learning for the Information Economy: A Framework for National Collaboration in Vocational Education and Training 2000 – 2004*. It has since been re-branded as the *Australian Flexible Learning Framework for the National Vocational Education and Training System 2000-2004 (AFL Framework)*.

The *AFL Framework* was developed by the Flexible Learning Advisory Group (FLAG, which was formerly known as the Education Network Australia Vocational Education and Training Advisory Group, (the EdNA VET Advisory Group or EVAG). It represents a strategic plan for the five-year National Project allocation for Flexible Learning. It is designed to support both the accelerated take-up of flexible learning modes and to position Australian Vocational Education and Training (VET) as a world leader in applying new technologies to vocational education products and services.

The *AFL Framework* is supported by annual implementation plans. These plans identify specific initiatives and an allocation of resources within each of the five Goal areas identified in the *AFL Framework*.

The Fellowship, of which this report is one outcome, was awarded in 2001 as part of the *Australian Flexible Learning Framework Strategy 2001*.

August 2002

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Part Two

1. Introduction

The growing adoption and use of learning object technologies has had a significant impact upon traditional approaches to online learning. Both corporate and academic institutions with interests in E-learning are faced with choosing from systems that can provide far greater features to support online learning, now more than ever before. Vendors are developing dynamic and intuitive systems, claiming for example, the ability to adapt online learning to individual learner needs. A product innovation dubbed the Learning Content Management System (LCMS) has recently been born in to the arena of E-learning support systems. The fundamental component of a LCMS that differentiates it from other types of systems is that it manages online learning through the use of learning objects giving vendors the opportunity to build in greater and smarter features and functionality.

The purpose of this report is to summarise a research project involving a study in contemporary issues surrounding online learning. The focus of the research has been directed at learning objects and LCMSs. Through examination of several reports, articles, white papers and other publications authored by academic, vendor, client and third parties, Part A provides a summary of key topics and issues. In Part B appropriate materials have been gathered and compiled to provide a sound overview of systems technology and areas under investigation, including relevant definitions and descriptions. This report can be used as a summary overview of contemporary issues related to the area of e-learning, and provides a sound starting point for those seeking to learn more.

2. Learning Objects

The technology that underpins LCMSs is referred to as a ‘learning objects repository approach’, often called an ‘objectbase’, or ‘learning object architecture’. LCMSs aim to effectively manage the creation, storage and use of organisational content through the use of learning objects. The benefits of applying learning object technology are best described by work done by specifications organisation ADL in enabling the “ilities” of learning content. These are: reusability, accessibility, durability and interoperability. At its simplest, a learning object approach has the capacity to facilitate the “ilities” for the management of organisational learning content.

Certain difficulties were experienced in locating a single, concise and generally accepted definition for learning objects. An overabundance of definitions are available, all of which were found to be fairly broad and in-descript. When examining these definitions, commonly appearing key words, themes and features are easily identifiable. It is these recurring ideas found throughout ‘learning object’ definitions that identify the fundamental components of what a learning object should and should not be. Some basic learning object definitions are as follows:

“Any entity, digital or non-digital, that can be used, re-used, or referenced during technology supported learning”.

[- IEEE Learning Technology Standards Committee. \(LTSC\), \(2000\).](#)

“A reusable, media-independent chunk of information used as a modular building block for e-learning content. Learning objects are most effective when organized by a meta-data classification system and stored in a data repository such as an LCMS”.

- <http://www.learningcircuits.org/glossary.html>

“Any digital resource that can be used to support learning.”(Wiley II, 2001)

“Chunks of data that are used by e-learning systems – they are authored, stored, catalogued, assembled, delivered, and reported on.”

or

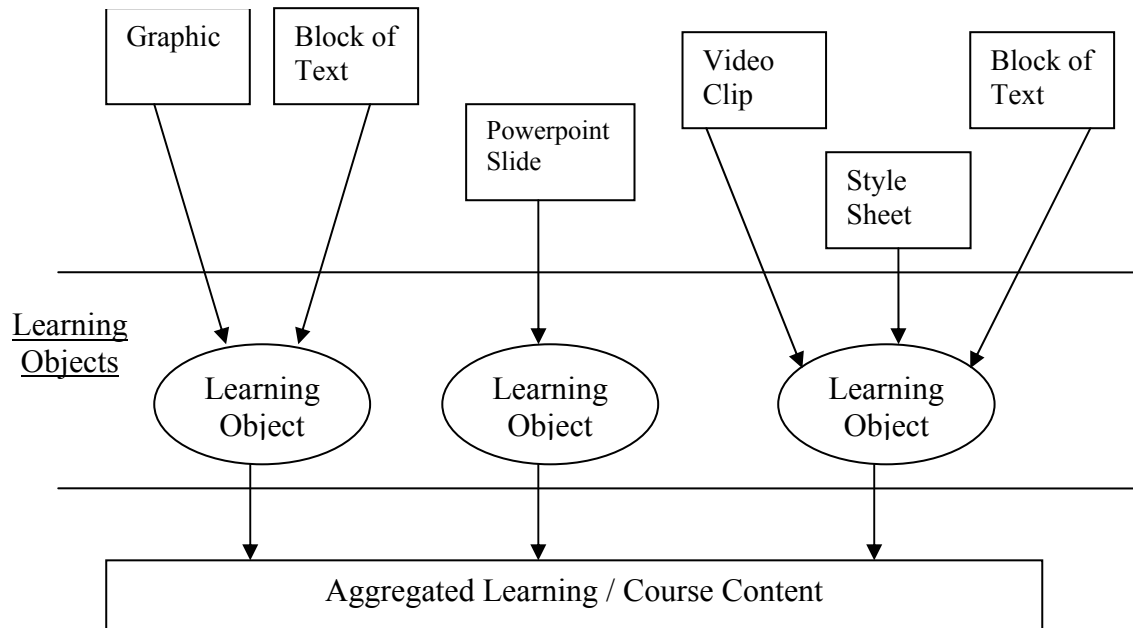
“A digital part of a course ranging in size and complexity from a single graphic to an entire course itself.”
(Collier, 2002)

A learning object can be any portion or unit of learning content, governed by usually one, but possibly more learning objectives, commonly ranging “from 2 to 15 minutes” to effectively learn (Chitwood, date unknown). Most definitions however, refrain from supposing a ‘size’ for learning objects (granularity). It is commonly suggested that learning object granularity should be defined by the organisation and its instructional design philosophy. There are many standards and specifications in place that propose guidelines for the design and creation of learning objects. The reasons for, and benefits to be gained from adhering to these standards and specifications are discussed later.

It is important to note that the above definition identifies the key aspect that distinguishes between granular learning objects and ‘content assets’. An asset is a piece of learning material in its most granular form, for example, a single piece of text, a graphic, slide, or an audio clip. A learning object is commonly made up of more than one asset. At an extreme degree of granularity, a learning object may be an individual asset, provided it satisfies at least one learning objective. More often than not however, a simple raw media asset will not sufficiently fulfil a learning objective and therefore fail to satisfy the criteria that defines a learning object. The concepts of independence and objective are fundamental to defining learning objects.

The following diagram illustrates the three layers of content creation.

Content Assets



Because definitions for learning objects are many and varied, identifying a distinct and comprehensive definition is best achieved through gathering a set of defining criteria. The following are summaries of commonly associated criteria and key elements used to define learning objects. They are distinct by author, yet noticeably similar in content.

Learning objects should be:

- **Self contained** and therefore can be taken independently
- **Reusable** in multiple contexts and for multiple purposes
- Able to be **aggregated** with other objects to form packages of learning content such as traditional course structures.
- Tagged with meta-data providing objects with descriptive information that enables efficient search and storage (Chitwood, date unknown)
- Modular, free-standing, and transportable among applications and environments.
- Non-sequential
- Able to satisfy a single learning objective.
- Accessible to broad audiences (such that it can be adapted to audiences beyond the original target audience).

- Coherent and unitary within a predetermined schema so that a limited number of meta-tags can capture the main idea or essence of the content.
- Not embedded with formatting so that it can be repurposed within a different visual schema without losing the essential value or meaning of the text, data, or images.
(Longmire, 2000)
- Content: a learning objective, the content and learning activities support that objective, and the assessment that's mapped to the learning object.
- Size or seat time: a chunk of learning that takes no longer than 15 minutes to complete.
- Context and capabilities: a nugget of learning that can exist stand alone and be delivered to a learner on an as-needed, just-in-time, just-enough basis.
- Tagging and storage: A piece of content that's described with a standard set of meta-tags.
- (Mortimer, 2002)

3. Standards and Specifications

Theoretically, the object based approach to learning content management enables the capacity for disaggregated portions of content to be searched, shared and reused. To do so however, there needs to be a uniform set of specification requirements generally accepted and applied to the creation of learning objects. Compliance with such specifications enables learning objects to be shared and reused through systems designed to read and recognise compliant objects.

3.1. Metadata

Like aggregated content, learning objects should contain meta-data. Meta-data is essentially data containing information about an object's distinct properties. Types of information commonly stored as meta-data may include 'author', 'date created' and 'version number'. Meta-data is a form of electronic cataloguing and identifies each piece of learning content as unique. Applying meta-data to learning objects facilitates a means by which objects can be efficiently stored, searched and maintained. Meta-data managed effectively, provides the building blocks to enable a system of version control. It is attached to learning objects commonly through a scheme of meta-tags. Learning objects are bound with an associated (usually XML) meta-tag file. This file should contain a scheme of individual property fields (meta-tags) that describe the object completely.

The following articles provide further information regarding meta-data and meta-tagging and can be found at:

Understanding Metadata

www.service.tas.gov.au/papers/understanding_metadata.htm

Metadata, Schmetadata

<http://www.elearningmag.com/elearning/article/articleDetail.jsp?id=18574>

The aim of adopting a common set of specifications is to realise a standardised approach to the creation of learning content. Conforming to specifications and standards aims to enable content to interoperate with different systems and platforms, and allow it to be shared and reused. Widespread adoption of uniform content creation, management and metadata specifications has only been achieved with moderate success. This is because current work involving standards and specifications has not yet reached a mature stage. A brief overview of the key organisations involved in the development of standards and specifications, and their works is as follows.

3.2. Types and Organisations

3.2.1. AICC (Aviation Industry CBT Committee) - <http://www.aicc.org/>

The AICC is an international association formed to develop standardised guidelines for instructional material. Initially aimed at aircraft manufacturers and buyers, the AICC specifications have been adopted by other industries involved with e-learning to promote interoperability. AICC specifications include 9 active categories. These are the AICC Guidelines and Recommendations (AGRs). As follows:

- AGR - 001 - (No longer maintained)
- AGR - 002 - Courseware Delivery Stations
- AGR - 003 - Digital Audio
- AGR - 004 - Operating / Windowing System
- AGR - 005 - CBT Peripheral Devices
- AGR - 006 - Computer Managed Instruction
- AGR - 007 - Courseware Interchange
- AGR - 008 - Digital Video
- AGR - 009 - Icon Standards: User Interface
- AGR - 010 - Web - Based Computer Managed Instruction

3.2.1.1. Certification vs. Compliance

Any course or e-learning support system that a vendor claims as ‘AICC compliant’ need only conform to the specifications laid out by one or more of the AICC Guidelines and Recommendations (AGRs). Compliance to 7 out of 9 of the AGRs is not moderated through testing by the AICC or a third party. ‘Compliance’ therefore, to specific AGRs is open to interpretation. The AICC however, offer formal certification testing for the two Computer Managed Instruction (CMI) AGRs (6 and 10).

3.2.2. ADL (Advanced Distributed Learning) - <http://www.adlnet.org/>

The ADL began as an initiative of the U.S.A. Department of Defence sponsored by the U.S. government. The initiative involves a collaborative effort between Government, industry and academia to develop standardised requirements for enabling the 'ilities' of learning content. The primary outcome of the ADL efforts is a set of rules governing the creation of highly granular learning objects. Combining many other leading specifications such as work done by the AICC, IMS and IEEE, ADL has worked in close cooperation with these organisations to develop SCORM (Sharable Content Object Reference Model).

3.2.2.1. SCORM

SCORM combines the work of different organisations to create a single uniform specifications model for the development of web-based learning. SCORM is focused upon enabling the reuse of web-based learning content across multiple environments and software products. SCORM is divided into two categories, the SCORM Content Aggregation Model, and the SCORM Run-time Environment.

The SCORM Content Aggregation Model sets out specifications for content assets, granular objects and aggregated content including defining schemes for meta-tagging and XML based specifications that provide structure for course content. The Run-time Environment establishes a set of technical specifications applicable to content packages enabling communication with e-learning systems. When systems adopt the SCORM Run-time Environment and content is packaged as SCORM compliant, a greater level of interoperability is the desired result. ADL offers a SCORM conformance-testing suite available for download.

3.2.3. IMS (Instructional Management System – Global Learning Consortium) - <http://www.imsproject.org/>

The IMS combines members from educational, commercial and government organisations whose goal is to establish and promote open specifications for facilitating online learning. The IMS focuses primarily upon meta-data specifications however the specifications established by the IMS also aim to enable the ability to locate and use educational content, track learner progress, report learner performance, and exchange information between systems.

“IMS has two key goals:

1. Defining the technical specifications for interoperability of applications and services in distributed learning, and.
2. Supporting the incorporation of the IMS specifications into products and services worldwide. IMS endeavours to promote the widespread adoption of specifications that will allow distributed learning environments and content from multiple authors to work together (in technical parlance, "interoperate").”

- <http://www.imsproject.org/aboutims.html>

3.2.4. IEEE LTSC (Learning Technology Standards Committee) - <http://ltsc.ieee.org/>

The purpose of the IEEE LTSC is to coordinate with other standards and specifications organisations in order to develop accredited technical standards, recommended practices and guides for learning technology. The committee includes approximately 20 working groups working to create individual yet interrelated standards for e-learning. IEEE working groups aim to:

“develop technical standards, practises, and guides for software components, tools, technologies and design methods that facilitate the development deployment, maintenance and interoperation of computer implementations of education and training components and systems.” (Wilson 2001)

The IEEE cover a broad range of topics including, learning object meta-data, learner profiling, lesson sequencing, CMI and content packaging. The IEEE works towards gathering and defining specifications and creating accredited standards from them. By repurposing specifications to meet the requirements of standards authorities such as ANSI and ISO, the IEEE aims to assist the evolution of specifications into globally recognised standards.

3.2.5. The Centre for Educational Technology Interoperability Standards (CETIS) - <http://www.cetis.ac.uk>

CETIS is not directly involved with the development of standards and specifications, but is rather an organisation best described as a voice that represents and assists UK interests with standards, specifications and associated organisations. For further reading on standards and specifications, the CETIS website provides numerous publicly available resources on the above standards, specifications and organisations.

4. Implications of adopting a learning object approach

Under a more traditional approach to the preparation of electronically deliverable learning content, course materials are commonly created for specific purposes that aim to satisfy a multitude of learning objectives. For example, a whole course or assessment task may be created and prepared in full (from the ‘ground up’) for online delivery. Using learning objects challenges traditional methods of creating course content. Learning content is disaggregated at the creation stage of the process. Learning objects are ‘created’, while actual course content is prepared through using multiple learning objects, existing and new, to compile whole course materials. The fundamentally beneficial result of using a LCMS is that it enables the ability to search, use and reuse existing content, objects within that content, and granular learning objects to assemble new learning materials. The system continually grows as existing content is updated or new content is added. Because an object based approach promotes share and reuse of content, every time this occurs, the content / object repository becomes a richer resource and adds value to the organisation as a whole.

4.1. Benefits

A learning object approach can provide many benefits not realisable through traditional approaches to content management. Warren Longmire, in his article: [A Primer on Learning Objects](#). (2000) summarises some of the benefits often put forward in support of a learning object approach. These are as follows:

- **Flexibility** If material is designed to be used in multiple contexts, it can be reused more easily than material that has to be rewritten for each new context. It's much harder to uncouple an object from the context of its parent course and then recontextualize it than it is to contextualize as part of design and development.
- **Ease of updates, searches, and content management** Metadata tags facilitate rapid updating, searching, and management of content by filtering and selecting only the relevant content for a given purpose.
- **Customization** When individual or organizational needs require customization of content, the learning object approach facilitates a just-in-time approach to customization. Modular learning objects maximize the potential of software that personalizes content by permitting the delivery and recombination of material at the level of granularity desired.
- **Interoperability** The object approach allows organisations to set specifications regarding the design, development, and presentation of learning objects based on organizational needs, while retaining interoperability with other learning systems and contexts.
- **Facilitation of competency-based learning** Competency-based approaches to learning focus on the intersection of skills, knowledge, and attitudes within the rubric of core competency models rather than the course model. While this approach has gained a great deal of interest among employers and educators, a perennial challenge in implementing competency-based learning is the lack of appropriate content that is sufficiently modular to be truly adaptive. The tagging of granular learning objects allow for an adaptive competency-based approach by matching object metadata with individual competency gaps.

Increased value of content From a business standpoint, the value of content is increased every time it is reused. This is reflected not only in the costs saved by avoiding new design and development time, but also in the possibility of selling content objects or providing them to partners in more than one context.

(Longmire, 2000)

4.2. Adaptive Learning

In its management of learning objects, one of the most valuable features of a LCMS is its ability to enable an E-learning environment that can deliver personalised (adaptive) learning with relative ease. With the ability to search and use existing learning objects, combined with newly created ones, course materials can be easily assembled 'on the fly' specific to a single student's learning requirements. Using tracking, student administration, and other integrated components, learning systems have the capacity to apply adaptive learning theory to content creation.

As a learner attempts course materials, systems can track the learner's progress and learning abilities with each individual learning object contained within that course material. With this information, the system can assess the specific needs of individual learners and adapt to deliver learning content to suit. Some systems claim to be so intuitive as to be able to adapt content not only to address student requirements, but also to individual learning styles. Chief Technology Officer, WBT Systems explains simply "...an LCMS gets the right content to the right person at the right time".
(Ellis, 2001)

This idea is further categorised by projects undertaken involved directly with learning objects at [Wisconsin Online Resource Centre](#).

Learning objects let you have learning that is:

- **Just enough** – If you need only part of a course, you can use the learning objects that you need.
- **Just in time** – Learning objects are searchable, you can instantly find and take the content you need.
- **Just for you** – Learning objects allow for easy customisation of courses for a whole new organisation or even for each individual.

- <http://www.wisc-online.com>. (2001)

The mission to continue to provide greater and better means of flexible learning is encouraged by the benefits to be gained using a learning object architecture. Flexible learning is focused upon a learner – centred approach that aims to allow "learning when the learner wants it, where they want it and how they want it." The object based approach facilitates this Flexible Learning philosophy. The 'Just in time, enough, and for you' approach to development and delivery of E-learning allows a greater propensity to deliver personalised course materials that are developed to unique learner's learning requirements and distinct learning styles.

A successful object approach to the management of online learning has the capacity to foster a total quality e-learning environment where content is always up-to-date, available, and efficiently stored and managed. Housed within a system where the object base is continuously improved, growing and therefore, continually adding value to the organisation as new learning objects are integrated.

5. E-Learning Support Systems Defined

Information systems supporting an e-learning environment deliver specialist functions that differentiate them from each other. Systems can be defined into distinct categories in relation to the primary purpose they serve. The types of learning support systems of concern here are, Content Management Systems (CMS), Content Delivery Systems (CDS), Learning Management Systems (LMS), and Learning Content Management Systems (LCMS). A brief synopsis of each system category follows.

5.1. Content Management Systems (CMS)

The function of a CMS is to perform the organisation, storage and management of enterprise 'content' efficiently within databases. The CMS supplies organisations with an enterprise-wide database repository that stores and organises content efficiently. Using a CMS benefits the organisation by relinquishing the responsibility of content management from content developers and IT staff. A CMS ensures that content is efficiently organised and available therefore freeing up human resources otherwise required to manage content databases manually.

CMS are designed as backend support for enterprise internet and intranet systems effectively separating content management from content development, presentation and delivery. As a result content developers need not be concerned with the physical storage and organisation of learning subject matter, but only the production and delivery of their content material. Raw content can be simply submitted to the CMS, with the system managing and applying predefined presentation settings and preparing the content for appropriate and uniform delivery.

The CMS efficiently stores content reducing the risk of duplication. For example, a content developer may require material from subject matter experts (SMEs) to produce a website. When this matter is delivered, it is usually duplicated with copies used each by the developer and the SMEs. This example of content duplication is not only inefficient, but becomes problematic when content is revised and updated in one location and not others. A CMS houses content portions as singular entities and makes them readily available across the organisation. Each piece of content is meta-tagged with information that defines it. If the appropriate person revises a portion of content, the meta-tagging is subsequently changed in order to reflect changes and hence provide version controlling. A CMS will commonly automate workflows to notify relevant parties of updated versions. CMSs provide a secure organised and efficient foundation for managing information in content rich organisations.

Content Management Systems

| | |
|---|--|
| http://www.author-it.com | - AuthorIT |
| http://www.lightspeed.com | - Lightspeed Astoria |
| http://www.documentum.com | - Documentum 4i |
| http://www.jdedwards.com | - J D Edwards Enterprise Content Manager |
| http://www.livelinx.com | - Live Linx |
| http://www.noonetime.com | - Noonetime Constellation |
| http://www.oracle.com | - Oracle iFS |
| http://www.trisoft.be | - Trisoft InfoShare |
| http://www.xyenterprise.com | - XyEnterprise Content@ XML |
| | - (Hackos, 2002) |

5.2. Content Delivery Systems (CDS)

CDSs function to ensure the technical preparation and delivery of digital materials to different platforms and technologies. A CDS provides the user accessibility to an organisation's content library. It enables the flexible delivery of materials, for example, via internet, intranet, PDA, mobile phone technologies, etc. These technical environments however, commonly operate on different protocols. For example, web browsers largely use HTTP although the internet also supports many other transfer protocols. PDAs and internet ready mobile phones use WAP. The CDS performs the necessary technical administration operations to enable content to be deliverable to numerous and varied platforms. I.E a web resource may be written in HTML using an editor. Whilst designed ideally for web delivery, the CDS prepares, enables and transmits that resource to other non-web devices.

Content Delivery Providers.

| | |
|--|------------------|
| www.akamai.com | - Akamai |
| www.digisile.net | - Digital Island |
| www.mirror-image.com | - Mirror Image |
| www.ibeam.com | - iBeam |

5.3. Learning Management Systems (LMS)

LMSs are focused upon the preparation, development and organisation of learning content for delivery. LMSs provide integrated tools for course administration, skills assessment and competency tracking. LMSs are essentially concerned with supporting the administrative processes involved with developing end-user-deliverable learning content. Post, and during content delivery, the LMS also manages activities responsive to delivered learning (tracking learner profiles). Sun Microsystems defines and outlines the key components of an LMS as follows:

“Full featured Learning Management Systems... provide the following major functions:

- Learner profile manager
 - Learner offering catalogue manager
 - Learner planner
 - Learner registrar
 - Connection to delivery environment for delivery of learning offerings
 - Delivery / participation tracking

- Assessment and testing tracking
- Assessment authoring tools
- Content assembler

In essence, they are intended to manage the learning environment, providing a place where content can be organised and presented to learners, learning plans can be managed, and where learning activities and results are tracked.”

(Collier, 2002)

LMSs have steadily been growing in size and complexity servicing greater needs and delivering more functions in support of online learning. Many have evolved to include integrated components such as comprehensive authoring and delivery tools. Often touted as ‘full featured e-learning solutions’ they are still identifiable as LMSs while their essential focus remains upon the criteria established above.

“In essence, an LMS primarily focuses on competencies, learning activities, and the logistics of delivering learning activities. An LMS **does not** focus on creation, reusability, management or improvement of content itself”. (Rengarajan, 2001)

Learning Management Systems

| | |
|------------------------|---|
| WebCT / Vista | - http://www.webct.com/ |
| Blackboard | - http://www.blackboard.com/ |
| LearnTone | - http://suned.sun.com/HQ/LMS/ |
| Saba | - http://saba.com |
| Thingq | - http://thingq.com |
| Click2Learn (Ingenium) | - http://click2learn.com |
| The Learning Manager | - http://www.thelearningmanager.com |
| Pathlore | - http://www.pathlore.com |

5.4. Learning Content Management Systems (LCMS)

LCMSs represent the newest innovation in E-learning support systems. The LCMS’s propensity to endow greater features and benefit is achieved through the architecture that provides the foundation the system. The system functions within an organisation to manage learning content through the use of learning objects. Underpinned by a learning object approach, the LCMS supports the notion that E-learning can be better supported, servicing organisations by offering a more efficient method of managing content from the initial, content creation stage of the process. That being, through employing learning object architecture.

A LCMS is responsible for supporting the creation, maintenance, improvement, management and delivery of online content via enabling the creation, use, reuse, search and storage of learning objects. As discussed earlier, the nucleus of learning object architecture is a central learning object repository (database or objectbase) that houses organisation wide content in the form of learning objects. Whilst the object repository of a LCMS performs essentially the same functions as the CMS, it is differentiated by, not how it stores, but what it stores. Rather than simply storing content as it is produced, an LCMS organises the management of content into disaggregate and individual learning objects. Objects are made available across the organisation for update and reuse. LCMS have often been described as combining the traditional functions of LMSs and CMSs (Nichani, 2001). Much has also been written suggesting LCMSs technology enabling enterprise wide sharing, search and reuse of content is bridging organisational knowledge management and E-learning.

The following selection of articles / papers provide more detailed information.

LCMS Roundup

- www.learningcircuits.org/2001/aug2001/ttools.html

A Smarter Frankenstein: The Merging of E-Learning and Knowledge Management

- www.learningcircuits.org/aug2000/barron.html

Learning Management and Knowledge Management

- www.brandonhall.com/public/whitepapers/lmkm/

The Brandon Hall article, [Learning Management Systems and Learning Content Management Systems Demystified](#) provides a succinct definition, and lists several common functions of LCMSs:

“A learning content management system is a multi-developer environment where developers can create, store, reuse, manage and deliver learning content from a central object repository.

The primary differentiator to determine if a product is an LCMS is if it offers reusability of learning content and is generally constructed using a learning object model.

An LCMS will generally have a majority of the following characteristics. You can use this checklist to determine if a software application could be called a learning content management system.”

- Based on a learning object model.
- Content is reusable across courses, curricula or across the entire enterprise.
- Content is not tightly bound to a specific template and can be re-deployed in a variety of formats such as e-Learning, CD-ROM, print-based learning, PALM, EPSS, etc.
- Navigational controls are not hard coded at the content (or page) level.
- There is a complete separation of content and presentation logic.
- Content is stored in a central database repository.

- Content can be represented as XML or is stored as XML.
- Content can be tagged for advanced searchability (both at the media and the topic level).
- Pre-tests and post-tests can be automatically aggregated from test questions written for the primary instruction. In addition, the system can deliver the test and prescribe learning based on performance.
- The system manages the development process by providing some level of workflow tools to manage a multi-developer, team environment.
- Version controls and archiving capabilities to store previous versions of content.
- Advanced searching capabilities across all objects in the repository.
- Interoperability with third-party learning management systems.
- Includes a delivery engine for serving up content, automatically adapting to user or group profiles, adding navigation controls, collaboration tools, utilities, and look and feel (skins).”

- http://www.brandonhall.com/public/resources/lms_lcms/lms_lcms.htm

Learning Content Management Systems

| | |
|---------------------|---|
| Top Class | - http://www.wbtsystems.com/ |
| Theorix | - http://www.theorix.com |
| Aspen | - http://www.click2learn.com/ |
| CDS / Outliner LCMS | - http://www.docent.com/ |
| SmartBuilder | - http://suddenlysmart.com |
| Hive LCMS | - http://www.harvestroad.com/ |

6. Summary

With the growing availability of e-learning suites, and integrated e-learning support solutions, many vendors are offering functionality beyond the traditional borders of their system categories. Studies have determined a high proportion of LCMSs include LMS functionality.

“The primary objective of a learning management system (LMS) is to manage learners, keeping track of their progress and performance across all types of training activities. By contrast, a learning content management system (LCMS) manages content or learning objects that are served up to the right learner at the right time.

Understanding the difference can be very confusing because most of the LCMS systems also have built-in LMS functionality.”

- http://www.brandonhall.com/public/resources/lms_lcms/lms_lcms.htm

The idea that clients want fully complete and integrated E-learning support systems is being quickly adopted by system vendors. Vendors are moving away from specialising in a particular category of product and toward developing 'E-learning suites'. An E-learning suite is a collection of integrated E-learning support systems increasing overall functionality of the product. James Lundy's annual report titled The 2002 E-Learning Suites Magic Quadrant, published by Gartner Research, lists the commonly found components in an E-learning suite as:

- LMS
- Virtual Classrooms / Delivery capabilities
- CMS, LCMS
- Professional Services.

Lundy's report, an analysis on several leading E-learning suites bares significant value to later assessments combined within this report. Included in the analysis are several of the systems summarised. Lundy positions each suite examined upon a four quadrant grid based upon vendors 'ability to execute' and 'completeness of vision'. Each quadrant is described by Lundy below.

“Leaders.

E-learning suite leaders have the highest combined measures of ability to execute and completeness of vision. They are doing well today and are prepared for the future. They must have strong channel partners, presence in multiple geographies, consistent financial performance, and scalable products, and the ability to deliver all four key e-learning suite capabilities.

Challengers.

E-learning suite challengers can execute today but have limited vision. They have strong channel, product and financial capabilities but do not lead the industry in innovation or strategic insight without change.

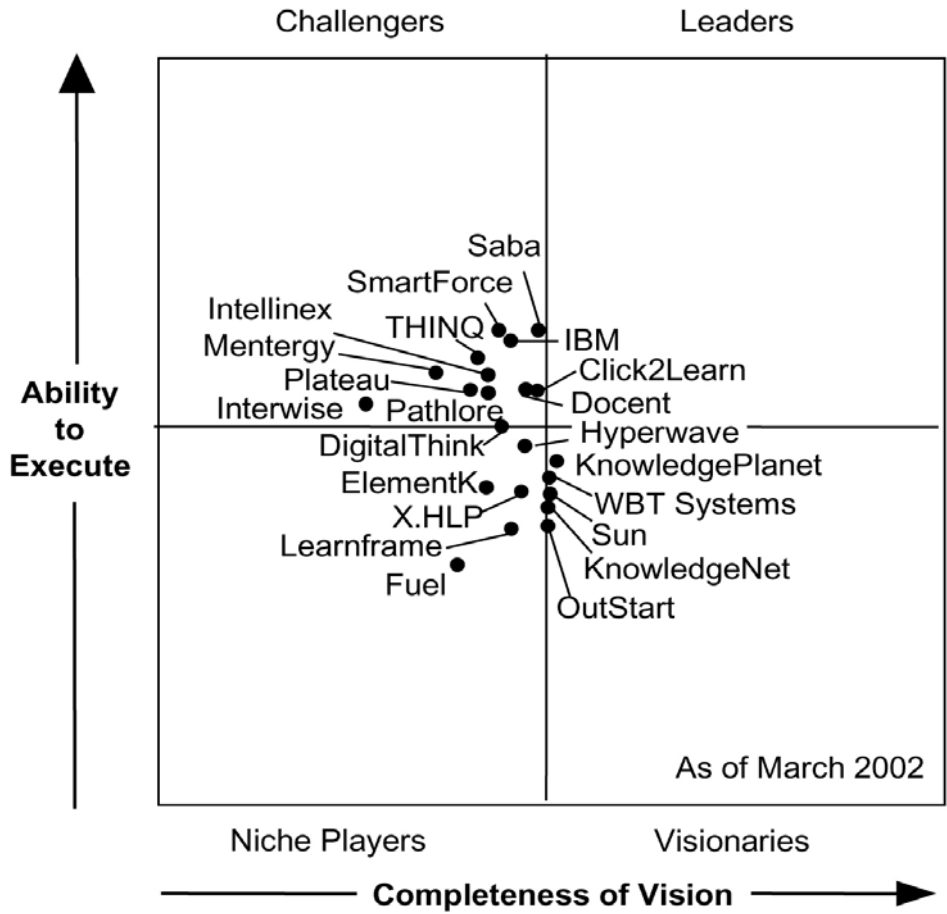
Visionaries.

E-learning suite visionaries have strong vision but are limited in their ability to execute.

Niche Players.

E-learning suite niche vendors have limited vision and minimal ability to execute in the general market. In a focused market (e.g., particular geography, or vertical or product segment), their influence may rise.”

Figure 1
E-Learning Suites Magic Quadrant



Source: Gartner Research

- Lundy, 2002

7. Conclusion

With the rapid development of technology and innovation, organisations are presented with the opportunity to provide better online learning. Employing a support system allows organisations to take full advantage of the Internet's capacity to provide learning online effectively. A LCMS provides the tools to enable organisations to undertake an object-base approach to enterprise content management. The adoption of a learning object approach to the creation, storage and delivery of online learning content presents many benefits to a learning content management strategy. A LCMS enables the ability to share, use and reuse individual objects for the creation of different content materials. Learning objects are managed by the system so that duplication of content materials is virtually eliminated. LCMSs clearly have the potential to present significant value to content rich organisations. Online learning support systems are evolving at a significant rate with object based learning technology representing the latest advancement in E-learning. By changing the way organisations create, store and manage learning content, LCMSs have the potential to bring benefit to any organisation committed to effective online learning.

PART Three.

1. Introduction.

The following component of this report includes a summary overview detailing the features of selected LCMSs assessed as part of the research project. Through examination of several current leading reports and articles, a set of criteria has been established as a basis for uniform analysis, summary and comparison. This section aims to examine several key functional areas considered important when assessing LCMSs, and provides a sound overview of each system's key features and benefits. Information used in this component has been compiled from primarily three sources. These are:

- Third party system analysis resources (reports and articles from current system users and researchers).
- Freely available vendor information (web based vendor resources and product information).
- Direct collaboration with vendor representatives.

2. Assessment Criteria.

2.1. System Overview.

This section provides a brief summary of each system under investigation. Areas examined include the system's distinguishing components, the vendor, and a description of the architecture in place used to support a learning object approach to content management. Coupled with any other aspects considered important to the system, this section aims to provide background information briefly summarising the system.

2.2. Technical Specifications.

The technical specifications and requirements (hardware and software infrastructure) necessary to support each system are summarised here in tabular format.

2.3. Cost / Purchase Information. (Where available)

As each system is costed / 'sold' differently, this section describes the particular methods used by vendors to cost their systems accompanied by the different purchase options available to customers.

2.4. Interoperability.

The area of interoperability was considered as one of the most important when assessing LCMSs. Each system's incorporation of leading specifications and standards has been assessed. In addition, the system's 'openness' and ability to integrate with other enterprise systems and content from third party providers has been examined. Some systems have included content and object authoring capabilities while others rely on the use of independent authoring software. The systems

examined were assessed for ‘built-in’ authoring tools, and more importantly whether authoring through the use of only these tools provided is enforced. Open integration with common authoring software therefore, was also a key assessment consideration. Likewise, some systems have restrictions on different types of file formats available for use in the creation and delivery of learning objects and content. Although most are able to utilise most common formats and file types, each system was checked for compatibility with a varied range of file types. The ease and ability of each system to integrate legacy content was examined as a key component of the systems degree of interoperability.

2.5. Key Features / Functions.

This section focuses upon several key features commonly included as integrated components of LCMSs, LMSs and CMSs. As system features and functions vary, this section aims to identify where each particular system’s feature strengths lie. Some systems are designed to support a specific limited set of functions (niche), while others have been developed to service a wider range of client needs (suites). Where systems have not demonstrated support of particular features, or where information is limited or unavailable, some of the features examined (listed below) are omitted from the system overview. Some of the features under examination have included:

Collaborative tools.

- Email
- Discussion boards
- Forums

Student administration tools.

- Testing
- Tracking
- Enrolment

Integrated authoring tools

Adaptive (personalised) learning delivery

Workflow management

Document control

Hosting

Offline delivery

Security

- Technical
- Roles

Vendor Support

3. Limitations

3.1. Limited information

- LCMSs are a relatively new product innovation in the arena of E-learning support systems. There is limited comprehensive information available that assesses these systems from an impartial perspective.
- Information has been found to be more readily available on some systems as opposed to others under investigation.

3.2. Verification / Validity

- The majority of information used in this report has been sourced from systems vendors themselves. Little information has been found about each system that verifies claims made by vendors regarding system features and functions.
- Time and resource constraints have resulted in this research relying upon the analysis of available information, rather than other more definitive methods such as systems use and testing.
- The research findings compiled within this report are accurate at the time of this reports publication. Due to the rapid evolution of information systems and technology (particularly in the arena of e-learning support systems), specifications and features offered by each system may change.

4. Systems Examined

The following LCMSs have been assessed compiling information gathered to provide an overview of each system's features under the pre-defined stated criteria.

| | |
|----------------|---|
| HarvestRoad: | Hive LCMS |
| WBT Systems: | TopClass |
| SuddenlySmart: | SmartBuilder |
| Click2Learn: | Aspen LCMS |
| Docent: | Outliner / Content Delivery Server LCMS |

4.1. Limit of assessments.

During investigation into available systems, a large number of LCMS vendors became apparent. Summaries for these systems have not been compiled due to a lack of publicly available information or identification of evidence suggesting systems would not meet the criteria for a LCMS. Brandon Hall, whose white papers have provided valuable background to this study have investigated and comprehensively reported on 29 LCMSs. Published in September 2001, this report is available for purchase at the following location:

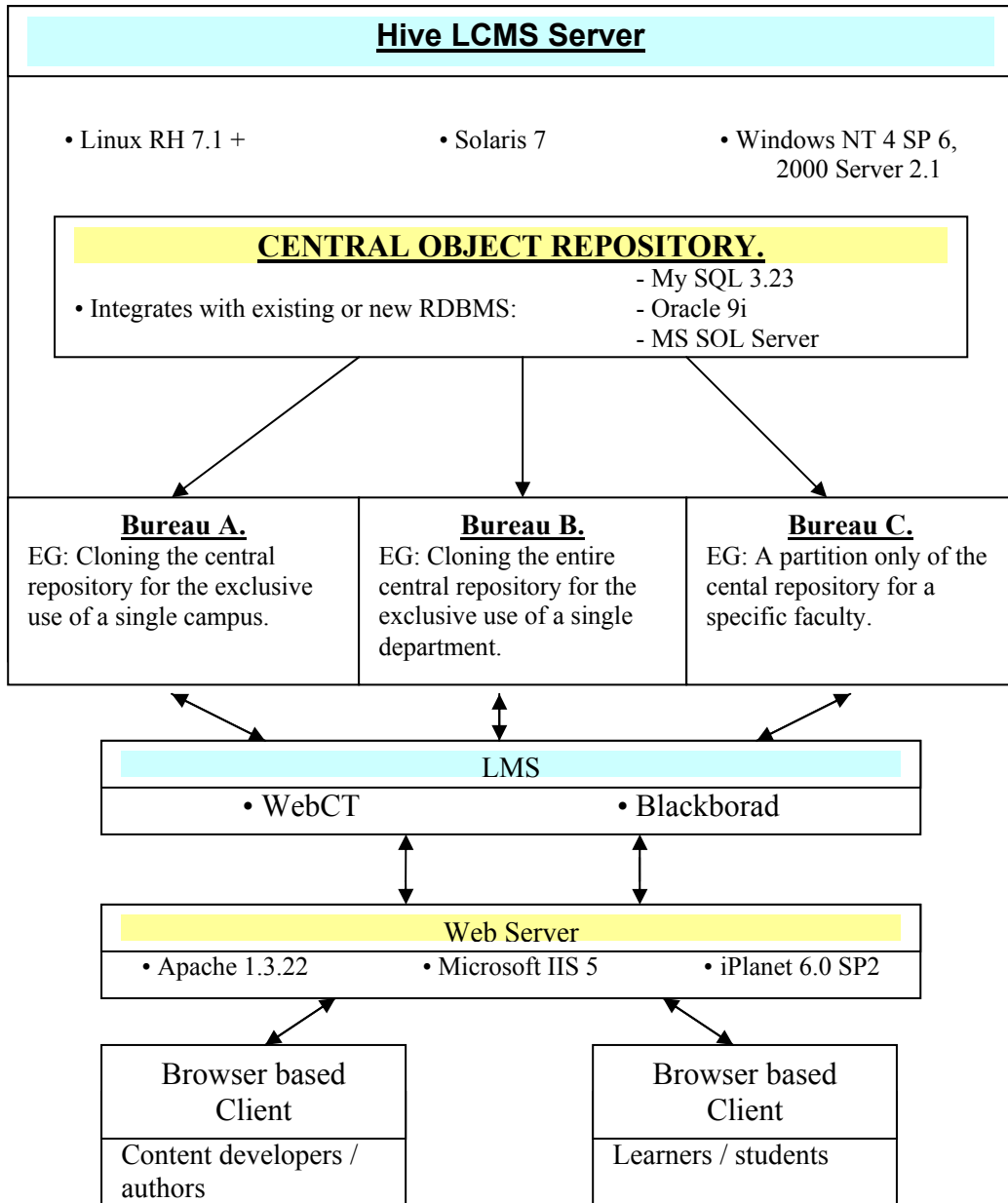
<http://www.brandon-hall.com/learconmansy.html>

System Overview: HarvestRoad - Hive LCMS.
www.harvestroad.com

Description

HarvestRoad is a publicly listed Australian company based in Perth (WA) with offices in Sydney (NSW) and Canberra (ACT). HarvestRoad has two applications which are based on the core product known as HarvestRoad Hive. These are HarvestRoad Enterprise Content Management System (ECMS) and HarvestRoad Learning Content Management System (LCMS). The ECMS specialises in content management and document control tailored to distributed corporate enterprises. The LCMS provides a digital repository for learning objects and is suited to the needs of K – 12, higher education, and corporate organisations.

HarvestRoad's LCMS is a completely web-browser based Learning Content Management System scaleable to the specific needs of individual organisations. It can operate on a distributed architecture both physically and logically separating purpose specific content repositories. The LCMS achieves this through the use of built-in "bureaus" and distributed server technology. Bureaus can be either complete clones, or specific partitions of the central object repository. They can be customised to service the specific requirements of distinct organisational groups.



Technical Requirements

| | |
|---|--|
| Server Platforms | <ul style="list-style-type: none"> • Linux (Red Hat 7.1 or later) • Solaris 7 (Release 2.3) • Windows NT 4 SP 6, 2000 Server (Future release TBD) • other ports on application |
| Client Platforms and Browsers | <p>Windows</p> <ul style="list-style-type: none"> • Microsoft IE5.01 on Windows NT • Microsoft IE5.5 on Windows 98/2000 • Microsoft IE 6.0 on Windows 2000 • Netscape 4.76 on Windows 98/NT/2000 <p>Macintosh</p> <ul style="list-style-type: none"> • Microsoft IE 5.01 on MacOS 9.04 • Netscape 4.76 on MacOS 9.04 |
| Databases | <ul style="list-style-type: none"> • MySQL 3.23.xx, Oracle 9i (release 2.1), MS SQL Server 7, 2000 SP 2 (release 2.1). • Other databases on application • either a new or pre existing RDMS installed prior setup |
| Web Servers | <ul style="list-style-type: none"> • Apache 1.3.22, Microsoft IIS 5, iPlanet 6.0 SP2 |
| Directories | <ul style="list-style-type: none"> • Any LDAP v2, v3 compliant directory, including Microsoft Active Directory, OpenLDAP, Novell NetWare |
| Server specifications (suggested minimum) | <p>Intel</p> <ul style="list-style-type: none"> • 2 x Pentium III 900MHz processor, 512KB Processor cache, 512MB memory (1 GB recommended) <p>Sun Sparc</p> <ul style="list-style-type: none"> • Dual 750MHz UltraSPARC-III 8MB cache 1GB DRAM <p>Notes: Dual processor recommended for content indexing process. Disk space dependent on collection size.</p> |

- [HarvestRoad Hive 2.0 Product Fact Sheet](#).

Cost / Purchase Options

HarvestRoad Hive LCMS is sold on a per registered user basis. Licenses for the system are sold per number of users registered. Users include any person accessing the LCMS (via user name and password) regardless of assigned roles. This includes student, along with content developer / author / administrator access.

Bureaus are purchased separately if required to provide separate faculties / departments with their own repositories. Alternatively in an ASP environment, the license holder of the Master Server can 'on-sell' bureaus to its customers.

Scale of System

HarvestRoad boasts ‘enterprise wide scalability’. Extreme ends of the scale are down to 600 staff and student users, and up to 200 000.

Interoperability

Standards Compliance

“Hive 2.0 supports SCORM 1.2 for metadata, which includes SCORM Assets, SCORM Content and SCORM Content Aggregation metadata. Hive also supports generic IMS metadata version 1.2.1. The SCORM metadata schemas are based on IMS, but with certain elements marked as mandatory for the type of objects being referenced.”

In the first release there will also be the facility to import a SCORM package and extract the metadata associated with it which can then be edited or added to. The resulting metadata can then be exported to an externally stored XML file or used to replace the existing one inside the SCORM package.

“Hive 3.0 will support SCORM Content Packaging, enabling you to create a package with SCOs and assets that are already published into Hive. The result is a manifest file you can then export to an LMS.”

“Hive 3.0 will also introduce functionality to import a package, disassemble into components (check in these items). Again, the result will be a package containing the manifest file that can be exported to an LMS.”

“The extensible metadata feature will be extended in Release 2.2 to enable any metadata scheme to be supported by Hive. A valid schema file can be used to generate the user interface and database structures.”

“At this stage, HarvestRoad envisage explicit support for Dublin Core, AGLS, EdNA and Intelink schemes. Others can be supported as required from release 2.2 onwards without change to the base product.”

- [HarvestRoad Hive Frequently Asked Questions \(FAQ\)](#)

“HarvestRoad’s support for, and participation in, industry standards bodies ensures that content developed by industry compliant 3rd party developers is capable of being accessed and shared across multiple courses within a Course Management System. LCMS will provide the ability to:

- Access multiple metadata standards including IMS (SCORM), AGLS, EdNA and Interlink.
- Automatically generate metadata for content published by Course Developers.
- Customise metadata schema employed by an institution to meet their specific needs through extensible metadata feature e.g. Digital Rights Management; and
- Map and search across multiple metadata schema to enable content developed by various 3rd parties to be linked to and shared across multiple courses from a single content repository.”

- HarvestRoad LCMS Product Overview, Apr 02.

Integrated Systems

HarvestRoad have partnered with Blackboard as part of the Blackboard Building Blocks program since its inception in 2001. The program is an initiative that aims to enable blackboard “customer, vendor, or partner to integrate external applications, tools, content, and services into Blackboard platforms”. HarvestRoad have employed significant resources into seamlessly integrating the HarvestRoad LCMS with Blackboard course management software. A description detailing some components of interoperability between Blackboard and the LCMS as published by HarvestRoad can be located at:

<http://www2.harvestroad.com.au/wppuser/harvestroadwebsite/prodhive/blackboard.html>

Talks between HarvestRoad and WebCT are currently underway for plans to integrate the LCMS with the WebCT Vista, Academic Enterprise System. The LCMS boasts a seamless login for WebMentor v4 enterprise Learning Management Systems and content authoring tools.

Authoring

Future releases (ver 3.0) of HarvestRoad LCMS will include extensions to Macromedia Dreamweaver enabling webpage creation using an object driven approach. I.E Dreamweaver will have the capacity allow content authors to identify and store objects within webpages directly in to the LCMS object repository.

Hive incorporates the Verity HTML export product to enable conversion of common file formats to be re-purposed in to HTML for web delivery. Supported file formats can be found at:

<http://www.verity.com/products/export/formats.html>

Future releases will see the inclusion of automatic conversion to both XML and PDF formats.

Legacy Content Integration

HarvestRoad LCMS does not possess the capacity to automatically disaggregate compound content in to individual learning objects. A manual process is necessary to repurpose existing content into learning objects.

Key Features / Functions

Integrated Authoring Tools

HarvestRoad LCMS does not include any integrated authoring software and relies upon content authoring through extensions made with third party products (Dreamweaver) and preferred independent authoring tools.

Adaptive / Personalised Learning Delivery

“LCMS supports personalised learning and the implementation of collaborative learning strategies through enabling learners to:

- Subscribe to specific areas of interest and receive automatic notification of new/amended content/resources;
- Share information and collaborate with peers and other members of learner’s community of interest via their ‘personal’ or ‘group’ content repository; and
- Have 24/7 access to a dynamic resource rich repository of course object and related resources.”

- HarvestRoad LCMS Product Overview, Apr 02.

Workflow Management

“HarvestRoad LCMS provides an integrated workflow engine that is designed to meet most needs for routing content items through typical sequences of approval. It is targeted at the market requirements for document and content authoring, collaborative authoring and metadata generation, and where the participants are likely to be geographically or functionally dispersed. Workflows are pre-defined by administrators and made available to end users through association with customer-defined "item types".

The integrated workflow engine consists of 4 elements:

- States (steps)
- Actions
- Participants
- Rules

“Users are provided with a task list interface, called the Workflow Monitor. The LCMS displays this screen upon entering the application if you have any outstanding tasks awaiting your attention. In addition, the LCMS sends e-mail notifications in the form of pre-defined and customised Alerts and Reminders to workflow teams to advise of new tasks, and sends e-mails to defined administrators if tasks are not commenced or completed within set periods. Hive automatically escalates incomplete work if required. Administrators can force steps to complete and proceed to the next step.”

- HarvestRoad Workflow Features, 2002.

Hosting

Hive LCMS has been designed for both full 3rd party ASP support as well as private customer deployment. The only limitations to the LCMS suggested by HarvestRoad are those brought about by physical resources limitations (disk space and memory).

Document / Version control

“Items are associated with customer defined "item types" (e.g., Press Releases, Product Specifications etc) and rules for enforcing the generation of versions and file locking are set at the item type level. This allows complete flexibility to enforce rigour where appropriate, or enable complete freedom in unregulated environments. Item types not only set the rules relating to version control and controlled editing, but also set the maximum number of versions, initial version number, metadata schemes that must be used to describe the item and workflows that must be used to verify the quality of the item.”

“Up to 9999 versions of an item can be tracked, maintained and accessed. Each version is referenced by a unique id that can be included in the Hive tag language. You can roll back to any previous version if required. Versions can be defined as major or minor revisions.”

“The item type can enforce controlled editing, which effectively locks the item whilst it is checked out for editing, preventing any changes during this check out period. Items in controlled editing must be checked back in before others can access for edit. You can prevent others from seeing the item whilst it's checked out, and perform an update of incremental changes but retain the checked out status.”

“When items are being edited during workflow, controlled editing is always enforced, even though the item type may not demand such control. This ensures the integrity and consistency of items at all times during a collaborative workflow.”

- HarvestRoad Version and Editing Control Features, 2002

Offline Delivery

Hive LCMS is purely a web based learning content management system and therefore has no offline functionality.

Security

Overview

“HarvestRoad LCMS uses a four-pronged approach to delivering complete data security within its content management system and related applications.”

Stream Security

“Streams are literally the "streams" of data that flow across a network. They are the messages and data that pass between processes, which may be executed locally within a server or remotely across a network. The LCMS dynamically selects the most appropriate method to ensure a balance between security and performance.”

“The LCMS uses Secure Sockets Layer (SSL) and the https protocol to secure the streams of data that flow between Hive system modules across the network.”

Identity Security

“To enable complete functional flexibility, it's important to be able to send user identification tokens across the Internet. The LCMS applies the most rigorous security encryption methods available to ensure that identity of users can never (practically) be exposed.”

“RSA security is used to encrypt the username and passwords. The level of encryption can be anything between 48 and 1024 bits. This is implemented as a separate, downloadable module to address encryption export rules.”

Transaction Security

“If a client "A" requests data from server "B", it's essential that an illicit user at client "C" can't impersonate server "A" and therefore trick "B" to passing the data to the wrong client.”

“LCMS uses RSA and protocol security to prevent requesting processes and servers from being impersonated.”

Data Security

“Actual files (items) can be encrypted before being stored within storage devices and media, if required. In conjunction, files can be compressed if required.”

- HarvestRoad Security Systems Features. 2002

Support

“...services can be provided in part or in whole by HarvestRoad, or with the inclusion of external systems integrators and consulting expertise:

- systems integration with external software, including additional testing
- installation and maintenance
- training for users and administrators
- addressing changes to business processes
- analysis of document-based business processes
- development of keywords, vocabularies and meta-data standards”

“Typically, the cost of services can range between 50% and 200% of the cost of the software products, depending on the scale and nature of the project.”

- HarvestRoad LCMS Product Overview, 2002.

HarvestRoad offer an installation service however; also suggest the process simple enough to be successfully undertaken by competent systems administration staff.

All information and resource material used in the compilation of this summary has been sourced from HarvestRoad. Website: www.harvestroad.com unless otherwise referenced.

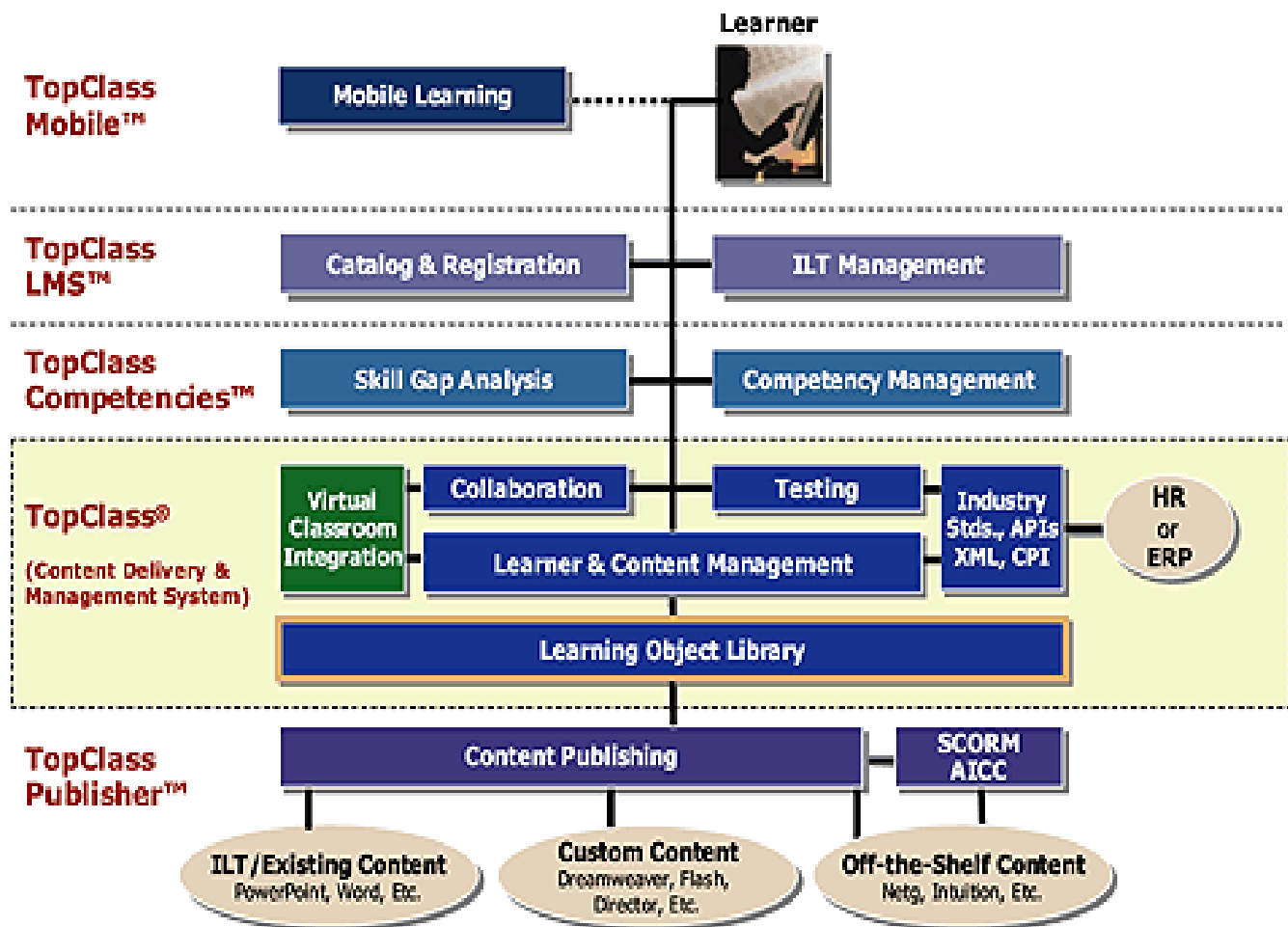
Acknowledgements: Lynda Masterman – HarvestRoad

System Overview: WBT Systems - TopClass LCMS 5.1
www.wbtsystems.com

Description

First launched in 1995, TopClass was designed from its inception to use a true learning object architecture. WBT Systems are headquartered in Dublin, Ireland and have a distribution office in North America servicing United States interests. WBT develop and sell a combined and integrated suite of otherwise separate and individual e-learning support systems. The TopClass Suite is comprised of the following components:

- TopClass LCMS
- TopClass Competencies
- TopClass Publisher
- TopClass XML Toolkit
- TopClass LMS
- TopClass Mobile
- TopClass Virtual Classrooms



- TopClass Architecture Diagram. -
[Http://www.wbtsystems.com/products/topclass](http://www.wbtsystems.com/products/topclass)

Although WBT systems has no business presence within Australia, TopClass systems have been adopted by several Australian higher education and training organisations. Some Australian TopClass customers include:

- [University of Melbourne](http://www.unimelb.edu.au/)
- [University of Technology Sydney](http://www.uts.edu.au/)
- [Deakin University](http://www.deakin.edu.au/)
- [Murdoch University](http://www.murdoch.edu.au/)
- [Canberra Inst of Technology](http://www.cit.act.edu.au/)

Technical Requirements

| | |
|---|--|
| Server Platforms | <ul style="list-style-type: none"> • NT Server 4.0 w/SP6a • Win2000 Server SP1 • Solaris 8.0 SP2 |
| Client Platforms and Browsers | <p>Windows</p> <ul style="list-style-type: none"> • Microsoft IE 4.0 SP2 • Microsoft 5.0 • Microsoft 5.5 SP1 • Netscape 4.6 and 4.7 |
| Databases | <ul style="list-style-type: none"> • Oracle 8i (8.1.7) (or) • MS SQL Server 2000 SE |
| Web Servers | <ul style="list-style-type: none"> • For NT Server platform <ul style="list-style-type: none"> - Microsoft IIS 4.0 or iPlanet 4.0 (Enterprise) • For Win 2000 Server platform <ul style="list-style-type: none"> - Microsoft IIS 5.0 • For Solaris 8.0 Server platform <ul style="list-style-type: none"> - Apache 1.3.12 -or- - iPlanet 4.1 (Enterprise) with SP2 for Solaris |
| Integrated Reports Tools | <ul style="list-style-type: none"> • Oracle Reports 6i for Microsoft environments -or- • Oracle Reports 6.0.8.10.1 for Solaris 8 environments |
| Server specifications (suggested minimum) | <ul style="list-style-type: none"> • Windows NT, Windows 2000 server <ul style="list-style-type: none"> - Pentium III or equivalent processor, 256MB of RAM 1 Gig Recommended, 60MB HD. • Solaris 8 <ul style="list-style-type: none"> - 256MB SPARC or UltraSPARC processors, 256MB of RAM |

Cost / Purchase Options

Costing for TopClass is based upon the number of registered users.

The TopClass suite of products can be purchased entirely or as separate modules. The core components of the LCMS include the TopClass Content Management and Delivery Server (CDMS) and the authoring environment TopClass Publisher. (Refer to diagram above)

Scale of System

TopClass boasts an open and scaleable architecture, suitable and scaleable to different sized organisations.

Interoperability

Standards Compliance

TopClass works to comply with all industry standards. TopClass is certified as AICC AGR010 compliant, SCORM 1.1 compliant and supports a full XML 1.0 compliant interface for data interchange. All content interchange and tracking standards (AICC and SCORM) are supported with simple drag and drop interfaces in TopClass Publisher. Publisher recognises content as either AICC or SCORM and automatically creates a learning object hierarchy based on the assignable unit structure within the content.

TopClass complies with all metadata standards including IMS and IEEE. TopClass follows a non-prescriptive metadata-tagging model. Default metadata items can be set up to ensure content developers are using the same template. Flexibility in metadata definition allows it to support a variety of specifications including both IMS (V1.2) and LOM metadata tagging.

WBT Systems are actively and continually complying with the standards proposed within the SCORM framework as it incorporates some of the IMS specifications. TopClass supports IMS Content Packaging Standards via SCORM 1.2 in a manner that will gain widespread adoption in the industry.

- Courtesy, Richard Coady – WBT Systems

Integrated Systems

Using its open APIs and XML interface, TopClass can integrate with complimentary applications, including Learning Management Systems, Virtual Classrooms, Enterprise Resource Planning systems, Human Resource systems, and third party content providers. Designed as a “best-of-breed” learning solution, TopClass’ XML API provides access to the entire data model and makes third party integration easy.

- Courtesy, Richard Coady – WBT Systems

“TopClass has engineered systems integration with Saba Learning Enterprise, Centra Symposium, NETg Web Player, and Oracle Reports, among others.”

- www.wbtsystems.com – [Features and Benefits of TopClass LCMS](#).

Authoring

In addition to its own authoring functions, TopClass authoring environment (Publisher), integrates seamlessly with any other authoring tools such as FrontPage or DreamWeaver.

- Courtesy, Richard Coady – WBT Systems

Format Compatibility

Courses can include any web-compatible multimedia content that can aid in learning, such as streaming media and simulations. TopClass supports embedded images, Shockwave, QuickTime, RealAudio, RealMedia, MPEG, Java applets, and JavaScript, as well as any other media that can be embedded into HTML pages. TopClass also makes it quick and easy to convert existing content, such as PowerPoint and Word files into web-based courses.

Word/PPT/HTML, Flash, Dreamweaver, Authorware, video and audio can be imported and managed in TopClass through a 'Drag & Drop' interface. All content in TopClass is saved as learning objects, allowing for future search, reuse and update.

- Courtesy, Richard Coady – WBT Systems

“Any type of content that can be delivered over the Web may be delivered and managed as Learning Objects in TopClass. This includes all of the common web formats such as Flash, Real, QuickTime, Acrobat (PDF), Windows Media Format, all graphic formats (such as GIF, JPEG and PNG), as well as of course, all flavors of HTML and XML (including DHTML and CSS).”

- Managing Knowledge with Learning Objects – The Role of a Learning Content Management System in Speeding Time to Performance. – A WBT Systems White Paper.

Legacy Content Integration

All Legacy Content is broken into Learning Objects, which can be easily Meta-Tagged, for re-purposing, search and assembly.

“TopClass Publisher includes the ability to automatically convert common legacy formats such as Word and PowerPoint into both a Web-deployable and learning objects format simply by dragging them into TopClass Publisher.”

- Managing Knowledge with Learning Objects – The Role of a Learning Content Management System in Speeding Time to Performance. – A WBT Systems White Paper.

Key Features / Functions

Collaborative Tools

“TopClass supports many types of collaboration among learners and trainers. TopClass provides moderated and unmoderated discussion lists, internal and external email, and class announcements. TopClass also seamlessly integrates with Virtual Classroom systems for holding live classes over the Web.”

- www.wbtsystems.com – [TopClass LCMS System Overview](#).

TopClass collaboration functions include internal messaging (email), threaded discussions, forums/bulletin boards and announcements. A key element of its messaging function is that it is contextual, i.e. the URL of the content being viewed is automatically embedded in the message allowing the recipient to simply click to view. The recipient is then able to easily view the content that the sender was viewing and thus gaining a better understanding of the context of the message. Discussion forums are automatically created for every course with unlimited levels of threading. These can also be moderated so that a designated instructor must view all postings before they are released for general view. TopClass Announcements is a one-way communication tool (bulletin board for instructors) used as a post for notifying all students of classes or upcoming events, eg. submission deadlines.

- Courtesy, Richard Coady – WBT Systems

Authoring Software

TopClass contains a WYSIWYG authoring and assembly tool - TopClass Publisher. Publisher makes extensive use of “drag and drop” techniques for HTML pages, DreamWeaver sites, live web pages, AICC and SCORM files, as well as Word and PowerPoint documents. TopClass Publisher has the capability to allow course structures to be created in the same easy to use fashion, based on familiar PC structures i.e. folders and pages.

- Courtesy, Richard Coady – WBT Systems

Student Administration Tools

Testing

Trainers can create a wide range of test questions, including true and false, multiple choice, text response, boolean, clickable images, and more, through TopClass Publisher's test and assessment functionality. TopClass enables tests, question pools, and questions to be stored as separate learning objects, making it easy to use in multiple courses. TopClass can also automatically correct tests or alternatively, send them to the trainer for grading.

Tracking

TopClass tracks and reports on class and individual learner progress. Trainers can easily monitor the progress of their assigned learners individually or by class. TopClass also integrates with Oracle Reports for powerful reporting capabilities.

Enrolment

TopClass can batch register and enrol learners into classes or have learners self-register and enrol. TopClass also provides web-based training administration management, including course cataloguing, registration, and administration of user groups, and ILT management.

Adaptive / Personalised Learning Delivery

Learners access courses through a standard web browser. Coursework is personalised to students existing knowledge and preferences through TopClass' test and assessment functionality. Learners only receive the training modules or learning objects they need to become proficient in new skills. Through personalisation, learners receive "just-in-time, just-enough" information.

TopClass dynamically delivers courses based on learners' individual knowledge level. TopClass automatically adds and removes learning objects and coursework by tracking and assessing learner performance.

Workflow Management

The main area of workflow relates to registration of users through the catalog (part of the TopClass LMS Module). This generates messages to the learner and any nominated approvers. A notice will appear on the learner's homepage advising them of pending enrolments or approvals. Learners are placed on the waitlist for an ILT event followed by an up-graded notification sent to confirm. 'No-shows' for ILT events are recorded and information is available to the instructor online as attendance records are updated. Completion details and certificates can also generate e-mails.

- Courtesy, Richard Coady – WBT Systems

Hosting

TopClass is designed for both local and ASP hosting.

Document / Version control

At present, TopClass does not provide automated version controlling measures however future releases are planned to include this functionality.

Offline Delivery

TopClass Mobile* enables offline delivery for users without a network connection to access learning materials exactly as they would within TopClass, including the same interface, personalised learning, and assessments. TopClass Mobile also facilitates the deployment of content on CD-ROM and DVD. The content delivered online requires

no further manipulation before use offline. Tests taken through TopClass Mobile are tracked, and results are synchronised once the user logs in to TopClass online.

* TopClass Mobile is not a core component of the TopClass LCMS.

- Courtesy, Richard Coady – WBT Systems

Security

Technical

Security in TopClass can be divided into essentially 3 pieces:

1. User Authentication

User authentication in TopClass is based typically on a username/password combination. The password can either be stored and managed by TopClass or managed by an external application and accessed using an SPI module. The TopClass Security Programming Interface (SPI) permits the use of alternative user authentication models such as Windows Unified Logon, LDAP authentication or other models, including proprietary models implemented by some customers.

2. Object level access rights

TopClass contains a security model which is designed to permit selective access to functionality and data based on a set of access rights assigned through a combination of explicit and implicit rights.

3. Data transmission

TopClass itself does not attempt to encrypt any user information as it passes over the network. Under most circumstances this includes user authentication information as well. (Unless an encrypted authentication scheme such as Windows Unified Logon is being used). However, TopClass is fully compatible with SSL servers. For implementations where interception of data in transmission is considered a potential risk, WBT Systems recommends that TopClass be run over a secure SSL connection. The use of SSL is transparent to TopClass although SSL encryption does impose a performance overhead on the web server and browser, which must encrypt and decrypt content on the fly.

- Courtesy, Richard Coady – WBT Systems

Roles

TopClass has 5 standard user roles each with different standard security rights. These roles are:

- Administrator
- Instructor
- Manager
- Content Creator
- Student

Within the instructor, manager and student roles the administrator can enable or disable certain functions, greatly increasing the scope of the profiles so that many “sub-profiles” can be created. For example, from an instructor perspective, it is possible to create a variety of sub-instructor roles, including:

- **Registrar** (permitting the instructor rights only to edit and enrol users in classes).
- **Mentor** (permitting the online mentoring of specific courses).
- **Content creator** (permitting the creation and update of content specifically assigned to you).
- **Content publisher** (permitting the uploading of content to the server, if a content publisher workflow procedure is in place).

The options in this area are wide and varied. Sub-profiles can be made up of any combination of possible access settings. Profiles in this case cannot be deleted. In order to add a person to a profile, it is necessary to simply alter their user account within TopClass to give them new rights via the appropriate new profile. It is possible to automate the assigning of sub-profiles through integration with a HR/ERP system (that contain the appropriate security information). In addition to the standard user administration interface, TopClass has powerful user management functionality through User Group Administration. This feature provides the ability to define sets of users within the TopClass environment and associate operations within these sets.

- Courtesy, Richard Coady – WBT Systems

Support

WBT Systems provide several means of customer support. WBT account holders are able to download product and software documentation as well as software itself for the appropriate systems. WBT also has worldwide contact support for product issues via email or online form. No local point of contact currently exists to service Australian TopClass customers. Future sales / support partnerships between WBT and local companies are however planned.

All information and resource material used in the compilation of this summary has been sourced from WBT Systems. Website: www.wbtsystems.com unless otherwise referenced.

Acknowledgements: Richard Coady – WBT Systems.

System Overview: Suddenly Smart - SmartBuilder LCMS
www.suddenlysmart.com

Description

Headquartered in Cardiff, California, Suddenly Smart specialise in the design and development of e-learning systems. The Suddenly Smart, primary software product, SmartBuilder is a completely browser based LCMS. SmartBuilder's distinguishing feature is that its design is based upon using Macromedia Flash graphics and animation technology. It includes content management functionality such as a shared data repository, workflow and version control. The systems focus lies in its intuitive authoring environment enabling creation and delivery of Flash – style interactive learning content.

Technical Requirements

| | |
|---------------------------------------|---|
| Server Platforms | <ul style="list-style-type: none"> Linux or Unix w/ Macromedia Generator. |
| Client Platforms and Browsers | <p>Windows</p> <ul style="list-style-type: none"> Pentium 200 Mhz processor (400 MHz Recommended) 64 MB RAM 800x600 Monitor, 16-bit colours IE 4.0, 5.0, 6.0 or Netscape 4.7X, (6.X not currently supported) Flash Player 5.0 <p>Macintosh</p> <ul style="list-style-type: none"> G3 233 Mhz processor 64 MB RAM 800x600 Monitor, 16-bit colours IE 5.0, or Netscape 4.7X, (6.X not currently supported) Flash Player 5.0 |
| Databases | <ul style="list-style-type: none"> SQL2000 DB2 Oracle 9 |
| Web Servers | <ul style="list-style-type: none"> Any J2EE compliant Java server |
| Server specifications (suggested min) | <ul style="list-style-type: none"> A single PIII application server with 1MB+ of RAM. (requirements may vary depending upon user volumes). |

Cost / Purchase Options

Suddenly Smart offers two pricing models.

1) Hosted Subscription

Suddenly Smart hosts the SmartBuilder application for a monthly fee. SmartBuilder is accessed over the web and no client side software is required. There is no set-up fee or minimum term for the subscription. This offering is typically used by small to medium sized organizations, or for pilot programs for larger organisations. Pricing ranges from approximately \$100 to \$200 per developer / instructor per month, depending on volume. The standard discount for educational institutions is 50% off of these prices. No additional charges are incurred for content publishing.

2) Enterprise License

The client organisation hosts SmartBuilder in-house. A one-time license fee is \$50,000 for one server or \$80,000 for unlimited servers plus a one-time license fee of \$2,000 per developer / instructor. Discounts are available for educational institutions. At higher user volumes, SuddenlySmart can provide a site license whereby an organisation has unlimited use of the application with no additional per-user charges.

- Courtesy Robert Penn, - SuddenlySmart

Scale of System

SmartBuilder is targeted at, but not limited to small to medium sized enterprises. The system itself has the capacity to accommodate a high proportion of users and content. As seen above, large scale systems are limited only by hardware infrastructure.

Interoperability

Standards Compliance

Content generated by SmartBuilder is SCORM 1.2 compliant and has passed the test suites provided by ADL for content packaging and run-time tracking. Focused upon a best-in-breed point solution for content authoring, it is a priority for Suddenly Smart to be standards compliant so the LCMS can easily integrate with 3rd party LMS/course management systems.

- Courtesy Robert Penn, - SuddenlySmart

Integrated Systems

Through SCORM compliance content created and generated using SmartBuilder can be used by other standards compliant systems.

Legacy Content Integration

SmartBuilder allows uploading of web capable media assets in various formats to the media library. Raw media, documents (i.e. MS Word, Powerpoint, .pdf, etc.), third party learning objects and third party courses can be uploaded from a user's computer into the SmartBuilder repository. After uploading, appropriate meta-tags must be entered by users to ensure SCORM compliance.

- Courtesy Robert Penn, - SuddenlySmart

Key Features / Functions

Integrated Authoring Tools

SmartBuilder includes a comprehensive integrated authoring environment. It boasts an intuitive development process through a WYSIWYG interface. The system allows the creation of granular learning objects that can be delivered standalone, inserted into existing course content or aggregated with other learning objects from the repository to create new learning content. Creation of course materials uses a step by step approach based upon selected predefined course design templates.

Workflow Management

Authors can assign one or more users to review each learning object. Reviewers can preview a learning object, make comments and provide an overall approve/reject rating. If the learning object is rejected, the author can view the comments and make changes. The cycle will continue until the learning object has been approved. Course authors can view a workflow dashboard which displays the approval status and comments for each learning object in a course as well as the overall course approval status.

- Courtesy Robert Penn, - SuddenlySmart

Document / Version control

When content is updated in SmartBuilder, previous versions can be archived. Authorised users can revert to archived versions and changes will be automatically reflected in content that reference the modified file. SmartBuilder also provides version control tools enabling users to switch between versions and analyse the impact of version changes.

- Courtesy Robert Penn, - SuddenlySmart

Offline Delivery

Authoring in SmartBuilder requires a web connection.

Content generated by SmartBuilder can be delivered to students online or offline.

Security

SmartBuilder functions within a role based environment where users can be assigned different security profiles limiting the rights they have within the system. The four primary roles and associated rights are:

Reviewers

Review content and create comments.

Authors

Create learning objects and courses, and assign reviewers.

Library Managers

Manage content libraries. Can move and copy content between categories, delete content, change versions, or reassign content.

Publishers

Publish courses to make them accessible to learners via the learning management system. Can select skins, which are look-and-feel elements including colours, layout, icons, etc., for the delivery interface.

*Note: Each role has the rights of the role listed above them.

- SmartBuilder User Manual revision 1.1

All information, and resource material used in the compilation of this summary has been sourced from SuddenSmart. Website: www.suddenlysmart.com unless otherwise referenced.

Acknowledgements: Robert Penn, CEO – SuddenSmart.

System Overview: Click2Learn - Aspen LCMS 2.0.
www.click2learn.com

Description

Click2Learn are a public company based in Bellevue, Washington, U.S.A. Specialising in the development of a comprehensive suite of software products, in combination designed to support extensively, corporate learning. Click2Learn's interests span internationally with offices in London and Tokyo. Asia Pacific operations are based in Sydney supported by a local web presence (currently under construction). The Aspen Suite of products combines three primary system components. The Aspen Learning Management Server (LMS), Learning Content Management System (LCMS), and Virtual Classroom Server (VCS). Together, they form the Aspen suite of products designed as a complete learning support system. Each component however, can be purchased separately and used independently.

*The following information may refer to features of the LXS or CDS. The Aspen LCMS has been developed combining technologies from Click2Learn products prior to the release of Aspen 2.0. These are, the Aspen Learning Experience Server (LXS) and Content Development Server (CDS).

Technical Requirements

| | |
|-------------------------------|--|
| Server Platforms | <ul style="list-style-type: none"> • Windows 2000 (presumably SP1) • Solaris (presumably 8) |
| Client Platforms and Browsers | <p>Windows</p> <ul style="list-style-type: none"> • Author <ul style="list-style-type: none"> - IE 5.5 and 6 for: Win98, NT 4.0, ME, Win 2000 and XP - Word 2000 or Word XP and PowerPoint 2000 or PowerPoint XP • Learner <ul style="list-style-type: none"> - IE 4.0, 5.0, 5.5, 6.0 for : Win98, NT 4.0, ME, Win 2000 and XP |
| Databases | <ul style="list-style-type: none"> • For Windows 2000 Server <ul style="list-style-type: none"> - SQL Server 7.0 sp4 or - SQL 2000 sp2 • For Solaris <ul style="list-style-type: none"> - Oracle V 8.1.7 or 9.i |
| Web Servers | <ul style="list-style-type: none"> • Microsoft Windows 2000 Server, IIS 5.0 |
| Integrated Tools | <ul style="list-style-type: none"> • Other Aspen Suite components. <ul style="list-style-type: none"> - Aspen LMS, VCS. |

Scale of System

The Aspen LCMS supports an unlimited number of users, projects, learning objects, and experts. The scalable architecture of Aspen supports heavy concurrent usage.

Interoperability

Standards Compliance

The Aspen 2.0 LCMS complies with AICC (JavaScript and HTTP), SCORM 1.1 and 1.2, and XML standards and specifications.

“ToolBook version 8.1 allows developers to create very rich and highly interactive content that complies with the major learning technology specifications today, including AICC and SCORM. Since version 8, released in December 2000, ToolBook has allowed the export of HTML-based content that complies with both the AICC so-called “HACP” protocol and the SCORM API protocol, which is also included in the current AICC specification. When the ToolBook 8.1 service pack 1 becomes available (released after the official SCORM 1.2 test suite), ToolBook authors can generate SCORM 1.2-conformant content packages.”

- Click2Learn Briefing: E-Learning Standards, 2001

‘Toolbook’ refers of Click2Learn’s content authoring product. Although an entirely separate product from the LCMS, Toolbook can however be integrated as an authoring component of the Aspen LCMS.

Integrated Systems

“The Click2learn authoring tools allow you to create content that uses the leading standards to permit delivery and tracking in the Aspen Learning Management Server (LMS) but also on other standards-compliant learning management systems.”

- Click2Learn Briefing: E-Learning Standards, 2001

“Aspen’s open architecture allows for easy integration with external enterprise and commercial systems. The Aspen programmable object model provides access to all the data and features available in the Aspen system through a well-defined Software Development Kit (SDK). The SDK makes it easy to integrate Aspen with existing business systems, including:

- Enterprise Resource Planning systems
- Supply Chain Management systems
- Purchase Order systems
- E-commerce systems
- Human Resource systems
- Line of Business systems

A built in Data Update tool enables customers to integrate the Aspen data store with any external relational database.”

- Aspen Architectural Approach: Benefits of the Aspen Architecture, 2001

Authoring Software

Including a WYSIWYG editor, the Aspen authoring environment is template driven. The system includes a comprehensive library of pre-built templates as well as an editor enabling authors to create custom templates.

“Aspen CDS allows instructional designers to enforce content uniformity and best practices through templates. Templates essentially define page layout, behaviours, and actions. Templates enable a consistent layout, look and feel, and user experience throughout a course. An extensive library of immediately useful templates is provided with Aspen CDS. Custom templates can also be easily engineered to meet the specific instructional design needs of a specific course. Aspen also supports authoring assessments and questions that provide immediate feedback or delayed feedback.”

- Aspen LCMS: Click2Learn’s Comprehensive LCMS Solution, 2001

“Aspen LCMS enables media developers to use preferred media creation tools to create graphics, audio, animation and video” that can then be aggregated into course content using the included WYSIWYG screen editors.

- Aspen LCMS Datasheet

Format Compatibility

“Aspen’s LCMS solution supports a wide variety of content formats. Almost all Web-enabled content is supported, including HTML, DHTML, Flash, jpg, gif, bmp, swf, wav, mpeg, avi, asf, rmi, mp3, ra, and ram. In addition, Aspen allows importing and re-purposing content created with Microsoft Office products such as Word and PowerPoint.”

- Aspen LCMS: Click2Learn’s Comprehensive LCMS Solution, 2001

Legacy Content Integration

“Aspen recognises the need to re-purpose existing knowledge documents quickly into standards compliant personalised courses. The Aspen Content Development Server supports importing various knowledge document formats including Microsoft Word, PowerPoint and any Web-enabled content. Knowledge workers can import documents created in these formats into Aspen and use simple drag-and-drop processes to create personalised courses within minutes.”

- Aspen Architectural Approach: Benefits of the Aspen Architecture, 2001

Key Features / Functions

Collaborative Tools

Authors

“With the aid of role-based security, templates and workflow capabilities, Aspen empowers instructional designers, subject matter experts, graphic designers, Web developers, reviewers, and testers to collaborate effectively to create personalised, standards compliant, high quality courseware.”

- Aspen Architectural Approach: Benefits of the Aspen Architecture, 2001

Learners

“Aspen enables learners to annotate and customise their content with notes and links to other resources. These knowledge items can be shared with peers, fostering greater collaboration between participants.”

- Aspen Architectural Approach: Benefits of the Aspen Architecture, 2001

Student Administration Tools

Testing

“Aspen can deliver a personalised set of topics to the user based on their assessment performance, dynamically adapting to their ongoing performance throughout the learning experience. Aspen also helps users finish their learning content in a timely fashion by offering them a personalised schedule and adapting the schedule throughout the learning process based on the progress made by the user at every point.”

- Aspen LCMS: Click2Learn’s Comprehensive LCMS Solution, 2001

Tracking

“*Tracks* can be used to allow different views of a course to be delivered to different users based on the user profile, preferences, time constraints, etc. For example, a course may have Beginner, Intermediate, and advanced tracks that may be delivered appropriately to users based on their previous level of knowledge in the subject. Or, a course may have Comprehensive and Overview tracks that can be delivered to users based on their time commitments and depth of knowledge desired in the particular course”.

“Aspen LXS tracks every aspect of content delivery to each user at a very granular level. Detailed tracking employed by Aspen LXS includes the time spent on each topic or question; the number of times a topic or question is revisited the level of proficiency achieved at each topic; the number of questions raised to the expert community in the context of a topic; the number of notes and annotations taken by

users on each topic, etc. This information is used to provide insightful reports on content usage, clarity, and effectiveness and can be used by the content author to improve the content by focusing on the relevant areas”.

- Aspen LCMS: Click2Learn’s Comprehensive LCMS Solution, 2001

“Through detailed tracking of every users interactions at the granular object level, Aspen enables rich reporting capabilities that provide insights into the health and performance of the entire learning experience... Aspen offers detailed individual and aggregate reports on learners’ performance in every learning activity at any content level – even down to an individual topic or question.”

- Aspen Architectural Approach: Benefits of the Aspen Architecture, 2001

Adaptive / Personalised Learning Delivery

“The personalised learning experience offered by Aspen considers several factors, including:

- User profile
- Current level of subject matter knowledge
- Personal learning goals
- Learning preferences
- Additional personal traits and behaviours

Aspen guides users through individual study paths that dynamically adapt to meet their changing needs”

- Aspen Architectural Approach: Benefits of the Aspen Architecture, 2001

Aspen’s strengths in its adaptive utilisation of learning objects is demonstrated by its ‘ask an expert’ feature. Learners can submit questions to the LCMS without having accessed course materials. The system analyses and determines the context of each question compiling and returning the relevant context materials to the learner. Each question and answer is automatically added in to an enterprise wide knowledge base and made available to other learners.

Workflow Management

“Aspen CDS provides a built-in workflow that promotes an efficient content development process. It supports setting and tracking completion status for content and individual media elements for each course. The status choices include:

- Started
- First Draft
- Complete
- Approved
- Rejected

This status information is displayed in reports so that a project manager can view real-time project status information on an asset-by-asset, page-by-page, lesson-by-lesson, or project-by project basis at any point in time”.

- Aspen LCMS: Click2Learn’s Comprehensive LCMS Solution, 2001

Hosting

Click2Learn Aspen products are designed to be hosted both inside and outside client firewalls. The Aspen LCMS can be hosted by Click2Learn, ASP or locally.

Document / Version control

“The authoring environment enforces a check-in/check-out model to guarantee content integrity. Anyone making a change is required to check out project elements (i.e., a lesson or topic) before it can be changed. After changes are made, an author can check the element back in. Check-in makes all the changes instantly available to all other people participating in that content development project. Authors also have the ability to undo a check-in operation, which essentially provides a fail-safe against unintentional or accidental check-ins. There is also a locking feature at the course level which prevents the course structure from being changed by multiple people at the same time”.

“Aspen includes built-in support for version control and change management at page level granularity. Every time changes are made to a course page and checked in, a new version of the page is created and stored. A history of version changes is maintained and an author can rollback or revert a page to an earlier version by selecting a previous version of the page”.

- Aspen LCMS: Click2Learn’s Comprehensive LCMS Solution, 2001

Offline Delivery

“Aspen allows you to maximize your investments by allowing you to create your content once and deliver it in multiple formats depending on your specific needs. Aspen-created content can be delivered via the Web as online courses, on CD-ROM, printed for classroom delivery or converted to Microsoft Word format for providing job aids”.

- Aspen 2.0 LCMS Datasheet, 2002

Security

“Aspen provides granular security within and across projects. Privileges are role-based, with well-defined privileges for instructional designers, subject matter experts, media developers, graphic artists, content reviewers, and project administrators”.

- Aspen LCMS: Click2Learn’s Comprehensive LCMS Solution, 2001

Support

“Every Aspen product ships with self-help resources to help you use the application effectively. These include user guides, online Help, and other Help documents. When these resources are not quite enough, Click2learn offers comprehensive, fee-based technical support resources and programs”.

- <http://home.click2learn.com/en/support/index.asp>

When purchasing the Aspen Enterprise Learning Platform or any of its individual components a one-year maintenance and support subscription is available for purchase.

Click2Learn also offer 3 paid service plans:

- Standard Support
- Premier Support
- Extended Operation Support.

For details regarding support options, please see:

http://home.click2learn.com/en/downloads/Datasheet_Aspen_Support.pdfhttp://home.click2learn.com/en/downloads/Datasheet_Aspen_Support.pdf

All information and resource material used in the compilation of this summary has been sourced from Click2Learn. Website: www.click2learn.com unless otherwise referenced.

Acknowledgements: Martin Cayzer & Jason Matthews – Click2Learn Asia Pacific.

System Overview:
Server. LCMS

Docent – Outliner / Content Development

www.docent.com

Description

Docent is widely considered leading the way in terms of LCMS technology appearing and performing well in Gartner's 2002 E-Learning Suites Magic Quadrant Report, along with works available at BrandonHall.com assessing leading LCMSs. Headquartered in Mountain View, California, Docent has offices throughout the United States, Europe, and Asia Pacific. Docent offer a suite of E-learning support systems, Docent Enterprise, which includes LCMS, LMS, performance measurement (Docent Peak Performance), collaboration (Docent Live), authoring and publishing (Docent Exchange) systems. Bringing together technologies from Docent products, Outliner and Content Development Server (CDS), the LCMS is an object based, standards oriented system that incorporates many functions to best support online learning. The Docent LCMS is available as a separate, individually priced component from the other systems that combine the Enterprise suite. Docent's LCMS's strengths lie in the delivery of adaptive learning online and offline, comprehensive integrated student administration functions, and conversion of legacy content. Docent's LCMS is powerfully suited to large scale corporate environments.

Scale of System

The Docent LCMS, along with all components of the Docent Enterprise suite is designed for deployment within large, global organisations.

Interoperability

Standards Compliance

Docent LCMS is compliant with AICC / SCORM standards enabling integration and interoperation with like compliant existing content and LMSs.

Docent currently supports three standards initiatives:

“AICC:

Docent was the first major LMS vendors to be AGR-010 (Web-based CMI Guidelines) certified by the AICC on 04-Feb-2000 and continues to support the ongoing evolution of this important standard.

SCORM:

Docent is an Active member of the ADL and participates in the ongoing development of the specification. Docent is compatible with SCORM 1.0, 1.1, and 1.2.

IMS/IEEE:

Docent actively participates as a member of the IMS committee helping define the future of learning content metadata tagging and has developed Docent Enterprise to conform to the specification.”

Source: http://www.docent.com/solutions/br_standards012.html

Docent provide comprehensive information, and white paper resources on the development of standards along with further about its LCMSs support of the above summarised standards. See the following resources at www.docent.com, or directly at:

- [Docent: A Leader in E-learning Industry Standards](http://www.docent.com/elearning/mandelkern_01.html)
- [How Standards Help Deliver the Best E-learning Solution](http://www.docent.com/elearning/standards.html)

Integrated Systems

Docent is designed to integrate with other components of the Enterprise suite however can integrate also with other standards compliant systems.

Authoring Software

Docent supports the creation of content using third party authoring tools such as Macromedia Dreamweaver, Microsoft Frontpage, PowerPoint and Word.

“Docent stopped short of creating an authoring tool for generating or editing the content that populates the course outline. Instead, Docent chose to remain authoring tool neutral in order to take advantage of the latest technology breakthroughs in HTML/XML or web content development tools and to allow developers to use popular or familiar tools. From within Outliner, Docent automatically launches the developer’s favourite HTML, XML, script editor, or other tool such as Microsoft Word or PowerPoint. Any content that is “dragged and dropped” into an Outliner course structure (HTML web pages, Flash objects, etc.) can be re-used in any other content development and delivery environment. Outliner saves content in its original format (HTML, XML, etc.), not a proprietary format”.

- [The Strategic Value of Docent Outliner & Content Delivery Server](#). Docent, May 2001.

Format Compatibility

Docent’s LCMS provides an open authoring system enabling a ‘drag and drop’ style interface for content structuring and assembly. File types include any web ready format including audio, video, animation, XML, HTML. This eliminates the need to learn proprietary authoring tools and offers simplicity in repurposing legacy content. The system also specialises in synchronisation and streaming of materials such as PowerPoint presentations and audio and video.

“Docent Outliner was designed to enable content to be easily repurposed in order to rapidly develop web-based learning activities. Docent Outliner allows the incorporation of any web-enabled multimedia content including audio, video, animation, dynamic HTML, JavaScript, and Java”.

- The Strategic Value of Docent Outliner & Content Delivery Server. Docent, May 2001.

Legacy Content Integration

In June of 2002, Brandon Hall conducted a testing suite for a variety of LCMSs to gauge the ability of systems to convert legacy content into self contained e-learning materials. System performance was judged on the 4 following categories.

- Ease of Use
- Speed of Development
- Robustness of the Learner Interface
- Content Conversion Capabilities.

Docent scored 1st out of all assessed criteria except in the area of speed where it was rated third fastest finisher. Docent was rated best overall performer from 8 systems tested.

For further information on the Brandon Hall ‘Legacy Content Conversion Shootout’ see: <http://www.brandonhall.com/public/simshootout/>

Key Features / Functions

Student Administration Tools

Testing

Docent’s LCMS includes tools to build HTML based assessment and evaluation applications within the system. This includes the option to choose from built in question types such as true / false, multiple choice, fill-in-the blank, image map, and unjudged essays. Questions can be organised and delivered using built in assessment settings. Settings include, database driven question pooling, skipping, randomisation, timed response and auto – advance.

“Docent Outliner is particularly strong at creating flexible and powerful web-based tests and evaluations without the need for programming or scripting. A robust array of question types are supported as well as assessment settings such as randomization and pools, timed response, multiple question retry, and optional display of feedback. Developers can create additional assessment types (or other types of content such as simulations) leveraging Docent’s CDS scripting object model”.

- The Strategic Value of Docent Outliner & Content Delivery Server. Docent, May 2001.

Tracking

Docent LCMS includes facilities to track individual and group learner progress in order to effectively correlate to desired business objectives.

Summary information (course completion notification, results etc) is automatically returned after students interface with learning content.

Adaptive / Personalised Learning Delivery

“Outliner enables the design of complex learning module structures necessary to support ‘adaptive’ learning experiences... The CDS provides the learner the ability to interact with the content based on the navigation and interactivity rules defined within Outliner by the developer”.

- The Strategic Value of Docent Outliner & Content Delivery Server. Docent, May 2001.

Hosting

Docent offer comprehensive tailored ASP and hosting solutions.

Offline delivery

Docent LCMS includes a delivery engine enabling content delivery to any browser enabled client (including wireless PDAs and smart phones) as well as disconnected personal computers. Learning content can also be delivered via hybrid mediums combining online content, CD-ROM, and hard drive content.

Version Control

Version control is achieved through the use of built in ‘check-in, check-out’ procedures.

Support

Docent provide dedicated online product support as well as paid services. These include, product customisation, documentation, training and software updates.

All information and resource material used in the compilation of this summary has been sourced from Docent. Website: www.docent.com unless otherwise referenced.

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URL: <http://www.adlnet.org/>. Accessed: Apr – Jul 2002

IMS (Instructional Management System – Global Learning Consortium)
URL: <http://www.imsproject.org/>. Accessed: Apr – Jul 2002

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URL: <http://www.cetis.ac.uk> Accessed July 2002

Vendor Websites.

HarvestRoad. URL:
<http://www.harvestroad.com/>

Top Class. URL:
<http://www.wbt systems.com/>

SuddenlySmart. URL:
<http://suddenlysmart.com>

Click2Learn. URL:
<http://www.click2learn.com/>

Docent. URL:
<http://www.docent.com/>

Theorix. URL:
<http://www.theorix.com>

Anlon Inc. URL:
<http://www.anlon.com>

SUMMARY

| | | | | Harvest Road | WBT Systems | Suddenly Smart | Click2Learn | Docent |
|---------------------------------|--|--|--|--------------|-------------|----------------|-------------|-------------|
| | | | | Hive LCMS | TopClass | Smart Builder | Aspen | Docent LCMS |
| Purchase Options | | | | | | | | |
| | License / registered users | | | ✓ | ✓ | ✓ | NS | NS |
| | Outright purchase | | | ✓ | ✗ | ✗ | NS | NS |
| | Modular - Requirements based | | | ✓ | ✓ | ✗ | NS | NS |
| Interoperability | | | | | | | | |
| | <u>Standards (certified / compliant)</u> | | | | | | | |
| | AICC (AGR-10) | | | ✓ * | ✓ | NS | ✓ | ✓ ** |
| | SCORM 1.1 | | | ✓ | ✓ | NS | ✓ | ✓ |
| | SCORM 1.2 | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | XML 1 | | | ✓ | ✓ | NS | ✓ | ✓ |
| | IMS (V.1.2.2) | | | ✓ | ✓ | NS | NS | ✓ |
| | IEEE | | | ✓ * | ✓ | NS | NS | ✓ |
| | <u>Systems</u> | | | | | | | |
| | Compliant Systems / Content | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 3rd Party Courseware | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Add components available | | | ✗ | ✓ | ✗ | ✓ | ✓ |
| | Partnered systems | | | ✓ | ✗ | ✗ | ✗ | ✗ |
| | <u>Authoring</u> | | | | | | | |
| | Any preferred authoring tool | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Integrated external tools | | | ✓ | ✗ | ✗ | ✗ | ✗ |
| | Integrated internal tools | | | ✗ | ✓ | ✓ | ✓ | ✗ |
| | Add on modules available | | | ✗ | ✗ | ✗ | ✗ | ✗ |
| | <u>Format Compatability</u> | | | | | | | |
| | Any Web enabled content | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | <u>Legacy Content Integration</u> | | | | | | | |
| | Automatic | | | ✗ | ✓ | ✗ | ✓ | ✓ |
| | Manual | | | ✓ | | ✓ | | |
| | N/A | | | | | | | |
| Key Features / Functions | | | | | | | | |
| | <u>Collaborative Tools</u> | | | | | | | |
| | Discussion Lists | | | ✗ | ✓ | ✗ | ✗ | NS |
| | Email | | | ✗ | ✓ | ✗ | ✗ | NS |
| | Bulletin Boards | | | ✗ | ✓ | ✗ | ✗ | NS |
| | <u>Student Admin Tools</u> | | | | | | | |
| | Testing | | | ✗ | ✓ | ✗ | ✓ | ✓ |
| | Tracking | | | ✗ | ✓ | ✗ | ✓ | ✓ |
| | Enrolment | | | ✗ | ✓ | ✗ | ✗ | ✗ |

| | | | | <i>Harvest Road</i> | <i>WBT Systems</i> | <i>Suddenly Smart</i> | <i>Click2Learn</i> | <i>Docent</i> |
|--|-----------------------------------|--|--|--|--------------------|-----------------------|--------------------|---------------|
| | | | | Hive LCMS | TopClass | Smart Builder | Aspen | Docent LCMS |
| | <u>Workflow Management</u> | | | | | | | |
| | integrated | | | ✓ | ✓ | ✓ | ✓ | NS |
| | <u>Document / Version Control</u> | | | | | | | |
| | Integrated | | | ✓ | ✗ | ✓ | ✓ | ✓ |
| | <u>Delivery</u> | | | | | | | |
| | Web | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Offline | | | ✗ | ✗ | ✓ | ✓ | ✓ |
| | <u>Security</u> | | | | | | | |
| | User Authentication | | | ✓ | ✓ | ✓ | ✓ | NS |
| | Roles Based Authoring | | | ✓ | ✓ | ✓ | ✓ | NS |
| | <u>Hosting</u> | | | | | | | |
| | Local | | | ✓ | ✓ | ✓ | ✓ | |
| | ASP | | | ✓ | ✓ | NS | ✓ | ✓ |
| | Vendor | | | ✗ | NS | ✓ | ✓ | ✓ |
| | | | | * Content developed to this standard can be stored in the LCMS | | | | |
| | | | | ** AGR - 10 | | | | |
| | | | | NS = Information not supplied / unavailable. | | | | |