

Comparison of the Blackboard Content System and Harvest Road Hive

The logo for 'emerge' features the word in a blue, lowercase, sans-serif font. To the left of the text is a stylized blue graphic consisting of two overlapping, rounded shapes that resemble a lens or a pair of eyes. The background of the slide includes a horizontal blue band with a thin brown line below it, and several large, light blue, overlapping circular and oval shapes that create a sense of depth and movement.

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Summary

Most of the institutions participating in E-merge are interested in working with a learning content management system. Within the framework of E-merge, Hive has been chosen as a system of first experience. In the educational project OP1.1, a number of pilot projects have been trialed in which Hive was used as the system. Blackboard launched a learning content management system in early 2004, called Blackboard Content System.

Harvest Road Hive and Blackboard Content System can both be classified as digital repositories (refer to the E-merge report entitled "*Learning content Management en de kunst van de ordening*" (Learning content management and the art of order), April 2004 for classifications. Both are also easily integrated with Blackboard LS. In a general sense they offer the same features and have therefore been assessed in greater detail as described in this report. Both systems have been compared on the basis of twelve case studies.

Blackboard CS would be the best choice if:

- The only goal is to simply store, manage and make available learning content within one educational institution.
- The system does not need to be used to exchange learning content with other educational institutions who would approach it with a different LMS.
- The use of a limited number of standard metadata sets (IMS LOM and Dublin Core) and one additional in metadata profile is enough.
- The use of a workflow process does not necessarily need to be managed by the system, and developers and reviewers of content themselves set triggers to initiate the next step.
- It is not necessary to make the learning content in the system available through a website, intranet site or an application other than Blackboard LS.
- The educational institution would like a ready-made portfolio system together with a virtual hard disk which allocates individual document storage areas to students.

Hive would be the best choice if:

- More than one institution wants to use the same (learning) content management system, for example with the aim to exchange learning materials.
- That more than one standard metadata set (IMS LOM, SCORM, Dublin Core) and multiple specific metadata profiles (e.g. for subject areas) are needed. The number of metadata sets to be used is unlimited.
- The system is not only used for learning content, but also for other content, such as visual material, accreditation documents, etc..
- Different workflow processes need to be supported, whereby the workflow process has been fed into the system beforehand and the steps in the process are triggered sequentially by the system.
- The LCMS also needs to make other sources with learning content available, for example a database of another educational institution or library.
- The learning content in the system needs to be available via a website, intranet or an other application.
- An open system is needed, that supports open standards and allows links with new applications in the future.
- There is enough knowledge within the institution to use templates to develop interfaces between Hive and other systems and between Hive and users.

Educational institutions that use Blackboard LS have the problem that the learning content is stored in many different places and often in different versions. It is hard to find the material and it is difficult to manage.

The Blackboard Content System can easily solve this problem. It is also capable of exchanging content **within** the organisation. The user friendly interface, very similar to Blackboard LS, will be easy to use for users. The fact that the Content System comes with a portfolio system and a virtual disk, could be an advantage for the institution.

Hive is also capable of solving the above problem. However, the user interfaces are somewhat different to Blackboard LS, which makes them a bit harder to use. However, should an institution be looking for a repository which allows exchange of learning content with other educational institutions, and which allows linkage with other content databases and require delivery through applications other than Blackboard LS, Hive would be the product of choice.

There is a common misunderstanding that the choice for Blackboard CS has hardly any impact for the existing management organisation. This only partly true. For the management of content and metadata it is necessary to add extra management tasks and responsibilities. This will be discussed in in the deliverable 'Advies voor het technisch en organisatorisch operationeel maken / implementatie van een LCMS' (in English: Advice for the technical and organisation implementation of a LCMS).

Future

Despite the fact that both companies are listed on the stock market, this isn't any guarantee for their future. Yanosky, Harris & Zastrocky of the Gartner Group (2004) expect that the e-learning market will stay unstable till the end of 2006. Blackboard tries to keep their customers by 'vendor lock-in'. Institutions are having more and more problems with the increasing licensing costs, which they have no control over.

Harvest Road has the strategy that they are independent of any LMS. This means that it is possible to store all your content in Hive and deliver it to different LMS's or to change to another LMS relatively easily, such as the open-source systems of Sakai (www.sakaiproject.org) or Angel (www.angellearning.com). Harvest Road is major supporter of the various standards, because this is essential for the simple connection with other systems.

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1. Introduction

Most of the institutions participating in E-merge are interested in working with a learning content management system. Within the framework of E-merge, Hive has been chosen as a system of first experience. In the educational project OP1.1, a number of pilot projects have been trialed in which Hive was used as the system.

Important considerations in choosing Hive were, amongst others, the need for a good integration with Blackboard LS. Another important aspect of Hive is that it can be used as a digital repository. Associated important features include good storage and access of various items (documents) in the database. The choice of Hive resulted in the creation of opportunities to store the content available through Blackboard LS in a well managed database area.

In the course of 2004, other systems have become available which seem to offer features that are comparable to Hive and are therefore now worth looking at in more detail. One of those systems is the Blackboard Content System.

Hive and the Blackboard Content System may both be classified as digital repositories (refer to the E-merge report "*Learning Content Management en de kunst van ordening*", April 2004, for classifications). Moreover, both integrate well with Blackboard LS. In a general sense they offer the same features and have therefore been assessed in greater detail as described in this report.

This report is the first version a draft of a deliverable to be submitted by the Ti-1 project. The aim is to do a detailed study and report of a number of other packages. However, at the moment there is an urgent need for more information regarding a comparison of Blackboard CS and Hive; hence this "intermediate-deliverable". In the spring of 2005, this deliverable will presented with one or more additional systems.

Brief overview

In chapter 2 you will find a brief description of the products that feature in this comparison of packages. In chapter 3, the criteria underlying the comparison of packages are described. Chapter 4 contains the comparison between Hive and Blackboard CS based on the criteria. Chapter 5 contains a number of case studies. In each case we indicate how Hive and Blackboard CS score. In each case we also indicate which package would be the preferred one for the case. Finally in chapter 6 we summarise the findings and chapter 7 contains the conclusions and recommendations.

2. Products

2.1 Blackboard Content System

Company

Blackboard is an American company established by Michael Chasen and Matthew Pittinsky in collaboration with Cornell University. They have been trading on the stock exchange since last year. Blackboard has clients all over the world and now also has offices and support sections all over the world. Blackboard International's head office is in Amsterdam and it has a large support section. Blackboard employs 450 people at its head office in Washington.

History

The company was established in 1996, initially with the Blackboard CourseInfo system, that is still the basis for the Learning System. Many new options have been added since. The Blackboard Content System was launched at the beginning of 2004. Version 2.0 was introduced at the end of 2004, which contained many new features when compared to version 1.0. The product is being developed incredibly quickly, but Blackboard CS has to catch up to Blackboard's LCMS which has been on the market longer.

Product

The Blackboard Content System consists of four different parts, which use the same basis, as set out in Figure 1. In this report we have mainly studied the Core Content Repository, Virtual Hard Drive and the Learning Content Management System. The E-portfolio module has not been included in this report, but is evaluated in depth in the E-merge E-portfolio project (OP3).

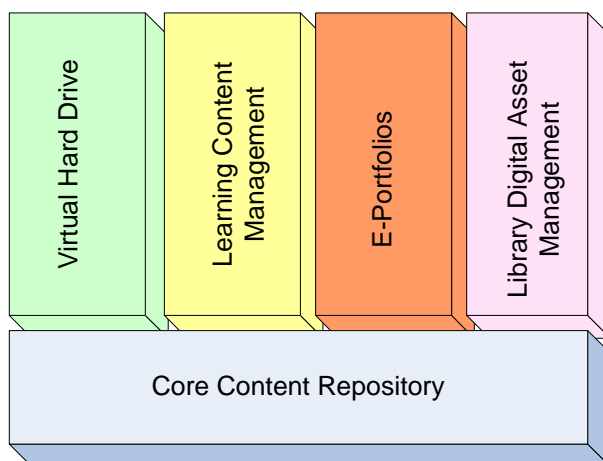


Figure 1: Components of the Blackboard Content System

Core Content Repository

At the core of the Content System is the Content Repository. All content objects are saved in the repository, which are therefore easily linked and re-used. The repository also manages access to these objects. A user can easily add, delete, find and share documents.

The system allows for the addition of metadata to each object, which makes it easy to find objects. Access to the objects depends on the rights assigned and may be set by the user himself. The

package also allows for version control using check-in/check-out, so that it is clear who is using a document.

Virtual Hard Drive

The virtual hard drive allows all users to easily store their data in the system. The manager can set a quota per user or group of users.

The system uses WebDAV. This is an open-source extension of the standard http-protocol, which means users can manage and work with files on a web server (refer to www.webdav.org for more information). This means users can easily access files stored on the virtual hard drive from wherever they are (campus, home, work experience). It is also easy for them to share these files with other students or lecturers. Files no longer have to be emailed backwards and forwards. Because of WebDAV it is also very easy for users to download and/or upload all the files in one directory.

Learning Content Management

Learning objects can be classified using this component, allowing lecturers and/or students to see and re-use these objects.

Library Digital Asset Management

Libraries would like to distribute their digital collections through on-line courses, but their valuable documents are often governed by copyright, which means they cannot put just anything on the web. The digital asset management system makes it easy for librarians to assess who has accessed the material, how often it has been accessed and how long it has been available to students. This makes it easier for lecturers to include materials from the library in their subject without copyright infringements and problems with royalty payments.

Librarians can add metadata to documents, e.g. Dublin Core, which also make it easy for lecturers to find.

Integration with Blackboard Learning and Community System

The Blackboard Content System uses many existing components of the Blackboard Learning and Portal System, as currently used by the various institutions. This makes it really easy for users to use the CS. The user interface is similar to the current Blackboard environment.

Version

Version 2.0.2.3 was used for comparison of the Content System.

2.2 Harvest Road Hive

Company

Harvest Road is an Australian company established in Perth, Western Australia. The company was established in 1996 and is listed on the Australian Stock Exchange. Until 2004 their main client base was in Australia, including the Ministry of Defence. Since then their client base outside Australia has become larger than their client base in Australia. Large international clients are Cranfield University in Britain and the Institute of Latin-American Education. Last year Harvest Road opened its European office in London, currently manned by one person. Harvest Road does have a number of joint venture agreements with local companies for support. In the Netherlands they have a joint venture agreement with Stoas.

History

Originally Harvest Road was mainly focused on the business world with Hive as a Content Management System. In the last couple of years they have also become involved in education.

Product

Harvest Road markets Hive as a federated digital repository. They distinguish three levels at which Hive can be used, as set out in Figure 2 below.

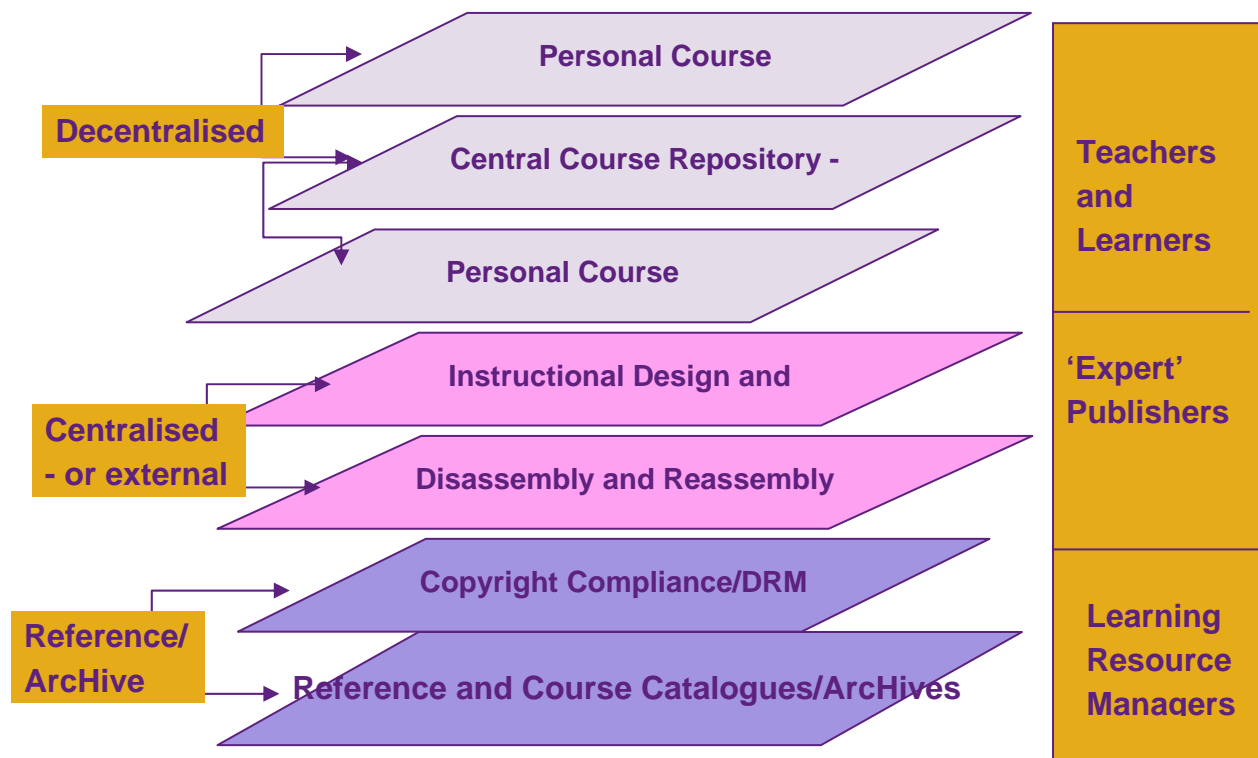


Figure 2: Hive target groups (Barty, 2005)

Hive allows users to store, view, search for, find, manage, share and reuse digital content quickly and efficiently within or outside an organisation. Users and content can be grouped in user groups with specific roles and rights, at different levels. Any type of digital or electronic files such as courses, images, presentations and material for diverse uses may be stored in Hive. Hive is independent from other software such as ELO. Any file format and its metadata is supported.

Hive offers standard interface with Blackboard and WebCT, but in principle the system can be linked to any ELO. Hive can also be linked to other databases and systems.

It is very easy to publish content using Hive Explorer and a Word Plugin.

Hive Explorer is a program the user installs on his own system which allows him to save a large number of documents in Hive, which he can also download. It is a Java program which means it works on all sorts of platforms.

Word Plugin is an addition to Word which allows you to store and work on Word-documents directly in Hive. The system also has extensive copyright management systems to protect intellectual property in accordance with the rules as they apply.

Hive offers the following functional requirements for the delivery of online educational material:

- **Version control** – always the right version
- **Workflow** – quality control and management
- **Access and permissions** – ensuring the right person can access the right file
- **Copyright** – protecting intellectual property
- **Flexible content rendering** – delivering files to different user interfaces
- **Rapid content assembly and disassembly** of learning objects for reuse
- **Distributed caching** and scalability

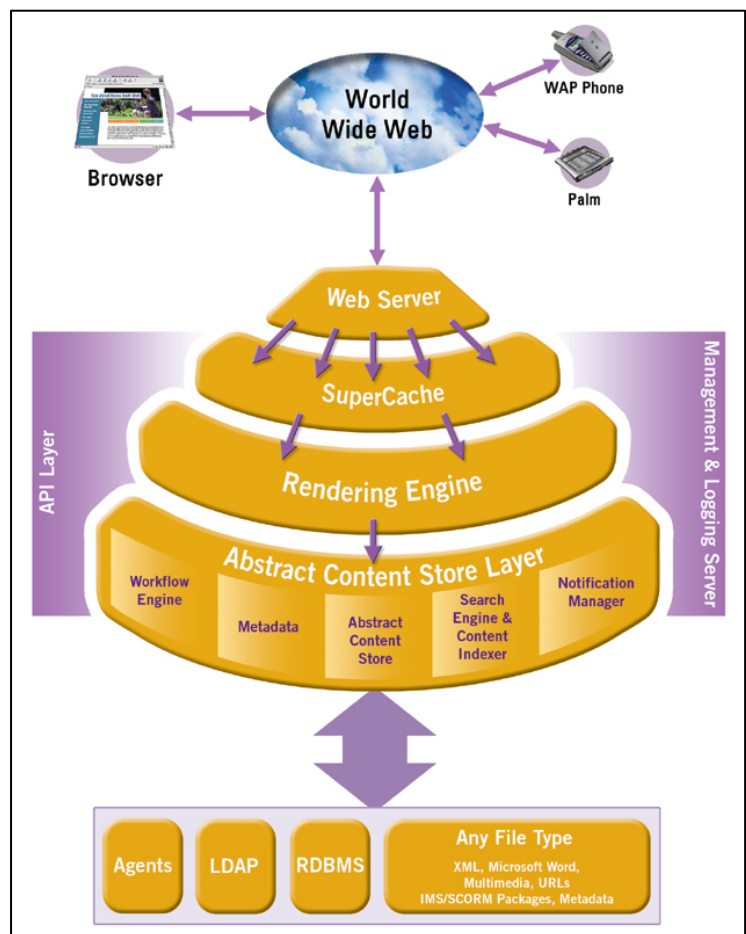


Figure 3: Hive Architecture

Version

Hive version 2.5 was used for this comparison. Hive version 2.3.1 was used for integration with Blackboard.

3. Criteria

We have used a large number of criteria for the comparison of the systems based on the book *Content Management and Portals; kennis- en contentbeheer op het web (Erkerl, Damstra, Klein, Keller; 2003)*. The criteria are explained below.

1 Content contribution

1.1 Integration with 3p tool for content creation

This sub-criterion evaluates the degree to which the system supports the development of textual information in an environment other than the LCMS. Integration with Office-type environments such as Microsoft Office and Lotus Notes is assessed. Integration is usually achieved using a macro in the word processor. Keys are used to make (part of) the content contribution feature of the CMS available in the word processor. Integration through WebDAV allows a content item to be dragged to a folder in the LCMS repository and the structure checked using 'drag and drop'.

1.2 Collaborative authoring

Often more than one person contributes to the content. Collaborative authoring means that more than one person can work on the same document in a different place at the same time. The system tracks the different changes and collates one document in an intelligent way.

1.3 Navigation structure

This sub-criterion relates to the possibility of establishing and maintaining a navigation structure in the publishing environment.

1.4 Metadata tagging

This sub-criterion assesses the options for introducing metadata. Metadata are introduced automatically or manually. In the latter case there is a form for metadata. A metadata template consists of both general metadata (above content type, e.g. 'author' and 'department') and specific metadata (type of content). The fields to be completed on the metadata template vary according to content type.

1.5 Link creation

Managing internal and external links, dynamic and static links. This allows you to access information from other sources using an LCMS, while the data stays in the same place.

2. Repository and library services

2.1 Content storage

This sub-criterion relates to the facilities for storing content. The content items and metadata are stored in a database, according to the manner (structure) in which the database is organised (database model). There are two types of database that can be used, the relational database and the object database. The remaining files (digital media files, documents, pictures, etc) are stored as Binary Large Objects (blob) or in file systems (folders and directories).

2.2 Bulk import and conversion

This sub-criterion assesses support for import of content. Existing data can be imported into the repository by uploading one or more files. The latter is known as bulk upload, usually in

the framework of a content migration trajectory, e.g. when a content management system is implemented. Existing content has to be converted.

2.3 Special object management

This sub-criterion assesses the degree to which the content management system is able to store and manage the different types of content within the organisation. Organisations often have more than just textual information. Examples of enterprise content are digital media files such as audio and video, but also pictures, scanned documents, technical drawings, source code for computer programs and product catalogue data.

2.4 Repository management

The repository is the central place in the content management system where content items are stored. The term repository leads one to believe that it is an entity but this is only the case if the data is stored in a central database. An organisation can also use more than one (distributed) database and/or file system. The content management system must be able to support more than one (distributed) database and more than one domain per database through delegated administration.

2.5 Versioning & tracking

The content management system must offer tools to guarantee the integrity of the stored content items. Version management allows for the retrieval of earlier versions of textual information, for the comparison of versions and for tracking changes.

2.6 Check in / check out

The check in/check out mechanism is the coordinating mechanism for version management. If an employee checks a content item out of the repository of the content management system, other employees cannot work on that textual information. The content item is blocked by one staff member; this means other staff members can only read it. Once the textual information is changed and checked in by the staff member, the content management system allocates a new version number.

2.7 Search & indexing content

To make finding of content possible the content management system must have search facilities in the editing environment. This sub-criterion assesses the various approaches for indexing and searching content itself.

2.8 Search & indexing metadata

This sub-criterion assesses the various approaches for indexing and searching metadata attached to content.

2.9 Classification of content

The content management system must make provision for establishing a structure for organising content items (e.g. a taxonomy). This sub-criterion looks at the way in which definition of categories and the criteria for classification of content items into categories is supported. The criterion also looks at the way in which the system 'fills' the categories based on the criteria used to classify content items in a category. Withdrawal of metadata from content items is also assessed.

2.10 Backup, archiving & roll back

This sub-criterion relates to archiving content items and retrieval of an old version (e.g. in the case of a legal matter). Sometimes after a certain period, part of the archive is no longer presented in the publication environment even though it can be accessed internally on the web server. After a certain period the textual information is no longer available for the staff members in the publication environment and the textual information is removed or migrated to an archive database.

3 Workflow management

3.1 Workflow design tool

This sub-criterion assesses the way in which the design of a workflow is supported. Is there a tool that allows for the design and development of a workflow? Is it easy to use, e.g. through use of a graphic interface? Are templates available? Or is there some other type of support? This criterion assesses the features the system offers for the design and development of different workflows.

3.2 Workflow management

Management of workflow is separate to design. This sub-criterion assesses to which extent editorial approval systems can be easily defined in the content management system for each type of content, including the roles, actions and rights of staff members for each step in the process. The possibilities the system offers in terms of reuse and import/export of process models are also assessed.

3.3 Routing

It is important for the content management system to support the most common patterns of workflow management regarding content. A pattern is an often used piece of routing. Routing consists of steps that make up a series of consecutive operations. The simplest form of routing is where a user can initiate one step or operation.

3.4 Event handling

Within the process of a certain type of content, events take place that trigger certain steps (e.g. sending of a notification). There are different events surrounding content, such as status changes, changes to textual information, due dates, deadlines, etc. This sub-criterion relates to, amongst others, the operations the content management system is capable of, following the expiry of a deadline.

3.5 Approval & revision control

This sub-criterion assesses the way in which the content management system facilitates approval processes surrounding content.

4. Publishing

4.1 Multi-site management

The content management system must be able to publish content in more than one domain (websites on the internet, intranet and extranet). This sub-criterion assesses features relating to publishing in different domains.

4.2 Multi-channel publishing

The content management system has to be able to publish through different channels (web, print, e-mail, etc)

4.3 Scheduled publishing

This sub-criterion looks at features relating to planning of publications. The CMS must include features that govern from which and to which date a content item may be published.

5. Usability

This criterion looks at how user-friendly the features of the content management system are. Distinction is made between the use of features relating to content contribution, repository and library services, workflow management and publishing. The different ways in which the package is user-friendly is assessed. The various roles are editor (in chief), designer, developer, business manager, website (domain) manager and system administrator. A further distinction is made between installation and user phase, which also includes maintenance. The assessment of user friendliness not only relates to features but also to the quality of the documentation and the extent to which support and training are offered in the Netherlands by the supplier and the extent to which the system allows for the development of personalised user interfaces. The latter applies for example to the choice regarding the placement of certain buttons and an opportunity to choose the language of the user interface.

Relevant sub-criteria are:

5.1 Administrator usability

5.2 Developer tools, wizards, menus

5.3 Client, instructor and author usability

5.4 Documentation, support and training

5.5 Localisation

6. Standards & integration

The degree to which the content management system supports standards and integration with existing applications, including Blackboard, is assessed; as are the standards that are supported by the package 'out of the box'. A distinction is made between database standards, directory standards, XML standards, integration and communication standards. The content management system has to support as many important standards as possible.

Standardisation of the communication protocols makes integration easier. Web services are becoming increasingly important under XML standards. The content management system needs to integrate with applications that present data in an editorial or publishing environment through the content management system. A distinction is made between internal transaction systems (such as ERP systems), external transaction systems (such as Customer Relationship Management systems) and non-transactional systems (such as word processors, email programs, document management systems and portals).

The relevant sub-criteria are:

6.1 Architecture

6.2 Enterprise application integration

6.3 Database standards

6.5 XML standards

6.6 Metadata standards

7. System management & security

7.1 Authentication

Authentication is the process which establishes that the user is who he says he is.

Authentication answers the question: who is it really? The content management system must

offer authentication mechanisms. Authentication may be based on a directory, though there are also other security procedures, such as PKI (public key infrastructure).

7.2 Authorisation & auditability

Authorisation is the process which establishes what the person may see or do. Authorisation answers the question: who may do what? The content management system needs to electronically support decisions of the owners of the content item regarding access to content items and the privileges relating to access.

7.3 Performance architecture

This sub-criterion assesses the scalability of the content management system. Large surges in the number of tasks need to be accommodated without sacrificing performance. This means the system has to be either horizontally and/or vertically scaleable. The tasks of the content management system have to be able to be divided over more than one server. Should there be a large increase in the number of tasks that need to be processed; new processing features need to be initiated.

8. Cost & implementation

8.1 Pricing structure

This sub-criterion maps the licensing structure of the content management system. The suppliers of content management systems calculate the licensing fee based on the number of processors, the number of authors, the number of clients in the editorial environment, the number of publications, the number of developers, the number of websites or a combination of the above.

8.2 License cost

This sub-criterion assesses the cost of the content management system. An indication of the minimum license fee, cost of maintenance and the average cost of the package is provided.

8.3 Implementation

This sub-criterion relates to the complexity of the implementation of the content management system, based on experiences other clients have had with the product. Cost of implementation will depend on current and desired status of content within an organisation, but something can be said about the average cost. The more complex the implementation, the more expensive it will be.

8.4 Maintenance

This sub-criterion assesses features relating to management of the system itself and the content of the system. It relates to items such as the time needed for system management and how often updates and bug fixes need to be installed. It assesses if temporary files, old versions or outdated files can be deleted automatically.

9. Miscellaneous criteria

Criteria described in paragraph 1 to 8, all relate to features of the product itself. A number of other factors often affect the final decision regarding the purchase of an LCMS.

9.1 Additional features

Some products offer more than just features relating to content management, e.g. relating to portfolio, virtual disks, authoring tools for developing content, arrangement tools for development of learning objects (such as SCORM packages).

It is important to know in which way the product offers these additional features, as modules that can be purchased separately or as integrated features.

9.2 Organisation: availability of tools – knowledge and management environment

Existing (or planned) infrastructure of an organisation may affect the purchase or choice of an LCMS. A number of organisations, for instance, already have a content management system, which may include a large number of LCMS features. In some cases a portfolio system has been purchased or developed and virtual disks have been made available to students. These organisations have invested in these products, have built up knowledge and expertise and have often established a management structure. A number of universities have an in-house programming platform with a preference for Java and/or .NET platforms which they will want to continue using. The existing environment may suit some packages better than others.

9.3 Politics

Within an organisation there is often already a preference for a certain product (zero hypothesis). Submission of a list detailing criteria for comparison of the various products may strengthen or weaken the preference but seldom results in a reversal. Particularly if the products are very similar and significant differences cannot be established.

9.4 Expectations regarding the future of the product and the supplier

Suppliers of product need to listen carefully to users: desirables and requirements surrounding E-learning need to be translated into features reasonably quickly. This means that suppliers need to issue upgrades and new releases regularly, which include these features as well as other new features. Examples of new features are the virtual hard disk, e-portfolio, copyright, payment modules, links to authoring tools, etc.

It is also important to know what the supplier's strategy is regarding the product, in which direction he intends to develop the product, which market he is targeting, how he collaborates with user organisations, how he processes input from users, how he intends to support you as his client, etc. Many products that are being used in the Netherlands are manufactured on a different continent (US, Canada, Australia). As educational philosophies differ, products may not suit the Dutch system AND the supplier may not be prepared to make the necessary adjustments.

These expectations regarding the future and the speed of the response can be a very important factor in the choice of product.

These miscellaneous criteria can be a deciding factor for an organisation when choosing a product. The danger is that criteria which relate to actual features become secondary. At a later stage – following purchase and implementation – this may lead to disappointment particularly if it becomes clear that a number of essential requirements have not been met.

Within the framework of E-merge Ti-1 we intend to focus on exchange and reuse of content. This is one of the objectives which will be very important in the changing educational environment. In the following chapters (chapter 5 in particular) the comparison of products focuses mainly on so-called 'hard' criteria.

4. Comparison

Both products have been compared in terms of the criteria as set out in the preceding chapter. A summary of the assessment of both systems is listed below, followed by an explanation of the assessment for each criterion.

LCMS:	Bb Content System	Hive
1: Content contribution		
1.1: Integration with 3p tool for content creation	+/-	++
1.2: Collaborative authoring	-	-
1.3: Navigation structure	-	-
1.4: Metadata tagging	+	++
1.5: Link creation	+	+
2: Repository & library services		
2.1: Content storage	+	+
2.2: Bulk import & conversion	-	-
2.3: Special object management	+/-	+
2.4: Repository management	+	++
2.5: Versioning & tracking	+	+
2.6: Check in / check out	+	+
2.7: Search & indexing content	+	++
2.8: Search & indexing metadata	+/-	++
2.9: Classification of content	+	+
2.10: backup, archiving & roll back	+	+/-
3: Workflow management		
3.1: Workflow design tool	-	+/-
3.2: Workflow management	-	+
3.3: Routing	+/-	++
3.4: Event handling	-	+
3.5: Approval & revision control	+/-	+
4: Publishing		
4.1: Multi-site management	-	+/-
4.2: Scheduled publishing	-	+
4.3: Multi-channel publishing	-	-
5: Usability		
5.1: Administrator usability	+	+/-
5.2 : Developer tools, wizards, menu's	-	-
5.3 : Client, instructor and Author usability	++	-

5.4: Documentation, support & training	+	+/-
5.5: Localisation	+/-	+
6: Standards & integration		
6.1: Architecture	+	++
6.2: Enterprise application integration	+/-	+
6.3: Database standards	+/-	+/-
6.4: Directory standards	+/-	+/-
6.5: XML standards	-	+
6.6: Metadata standards	+/-	++
7: System managem. & security		
7.1: Authentication	+/-	+/-
7.2: Authorisation & auditability	+/-	+/-
7.3: Performance architecture	+	++
8: Cost & implementation		
8.1: Pricing structure	+	+
8.2: License cost	-	-
8.3: Implementation	+	-
8.4: Maintenance	+	+
9: Miscellaneous criteria		
9.1: Additional features	+	++
9.2: Organisation: availability of tools – knowledge & management	Depends on the organisation	Depends on the organisation
9.3: Politics	Idem	Idem
9.4: Expectations regarding the future of the supplier and the product	+	++

The assessment is discussed further on the following pages.

4.1 Content contribution

1.1 Integration with third party tool for content creation

Blackboard Content System	Harvest Road Hive
<p>+/-</p> <p>In Blackboard CS items in a folder can be dragged to the repository using WebDAV. The advantage of WebDAV is that it is not necessary to install a program on a Windows computer. WebDAV clients are available for other platforms.</p>	<p>++</p> <p>Harvest Road Hive comes with Hive Explorer, a Java program that allows users to add files to the repository using 'drag and drop'. Harvest Road also offers Hive Rapid Publish for Microsoft Word, a plugin for Word which allows you to open and save a document direct from the repository.</p> <p>Both programs have to be installed separately. The advantage of Hive Explorer is that it is Java based and so works on every platform. The Rapid Publish for Microsoft Word only works in Windows 2000 or XP.</p>

1.2 Collaborative authoring

Blackboard Content System	Harvest Road Hive
-	-
Not supported	Not supported

1.3 Navigation structure

Blackboard Content System	Harvest Road Hive
-	-
The navigation structure is relatively standard with folders and sub-folders. Users have to go to the right folder to place a document.	When publishing an item you have to indicate in which category or categories the item is visible.

1.4 Metadata tagging

Blackboard Content System	Harvest Road Hive
+	++
Has IMS LOM, Dublin Core and a 'general' set to which you can add your own set. Metadata does not depend on the content type. Metadata cannot be imported or exported.	Hive contains a number of metadata sets (IMS LOM, Dublin Core, SCORM and others). Users can add an unlimited number of metadata sets. Specific metadata sets can be added to each content type.
	It is also possible to export and import metadata from an item, so these do not have to be retyped.

1.5 Link creation

Blackboard Content System	Harvest Road Hive
<p data-bbox="188 275 204 297">+</p> <p data-bbox="188 309 724 371">Each item is available through a direct link to users with relevant rights.</p> <p data-bbox="188 383 708 445">Content Passes can be created for external users, which allows them to view items.</p> <p data-bbox="188 456 703 519">Once you have published you have to click twice to see the link.</p>	<p data-bbox="778 275 794 297">+</p> <p data-bbox="778 309 1331 371">It is easy to create a link to an item. There are three ways to do this:</p> <ul style="list-style-type: none"> <li data-bbox="778 383 1007 405">- <i>Quick Fetch Link</i> <p data-bbox="778 416 1353 667">This link can be passed on to anybody with view rights to the document. If the document is public anybody can view it without having to log in. You can also indicate whether the link should always be to this version or the latest version, or to the original file or to the HTML version or that it is the user's choice.</p> <ul style="list-style-type: none"> <li data-bbox="778 678 938 701">- <i>HTML Link</i> <p data-bbox="778 712 1342 922">This makes it easy to open a link in an HTML document. You have the same options as with the Quick Fetch Link as well as the option to open the link in a new or an existing window. Lastly you can also add a name for the link, an alias, alias ID or own input.</p> <ul style="list-style-type: none"> <li data-bbox="778 934 994 956">- <i>Embedded Link</i> <p data-bbox="778 967 1321 1142">This is a link you can use for internal linking between different items, indicating if it should go to the current or latest version of the item and if the URL is absolute (including domain name) or relative.</p> <p data-bbox="778 1153 1347 1216">When you publish an item you are immediately given the option to create a link.</p>

4.2 Repository & library services

2.1 Content storage

Blackboard Content System	Harvest Road Hive
<p>+</p> <p>Uses a relational database; files stored in a file system.</p> <p>The system manager indicates what type of data must be stored in which directory at which file system level.</p>	<p>+</p> <p>Uses a relational database; files stored in a file system.</p> <p>There is no provision for indicating at which directory at the file system level certain types of data needs to be stored. This can be adjusted at the system level.</p>

2.2 Bulk import & conversion

Blackboard Content System	Harvest Road Hive
<p>-</p> <p>You can add the contents of a complete folder structure (including sub-folders) to the system in one go using 'drag and drop' to the application. Metadata tags need to be added to each file afterwards.</p> <p>It is also possible to move the content from an existing Blackboard course to the CS.</p> <p>Currently at the application level this has to be done on a course by course basis. At the system level this can also be done in bulk.</p>	<p>-</p> <p>Using 'drag and drop' in Hive Explorer you can add a large number of files to one category; it also allows you to add type of item, metadata and rights.</p> <p>Hive Explorer does not allow you to add an entire folder structure. It is possible to create new folders.</p> <p>At the system level all commands are available for bulk imports.</p>

2.3 Special object management

Blackboard Content System	Harvest Road Hive
<p>+/-</p> <p>Special objects can be stored but there are no specific provisions to manage, search for and view these objects. You would expect WebDAV to give you the option to preview pictures using the view feature in the browser (thumbnail), however this is not supported.</p>	<p>+</p> <p>Special objects can be stored but there are no specific provisions to manage, search for and view these objects. Hive allows you to create templates for special objects, e.g. pictures. Harvest Road have included the thumbnail option in version 2.5.1.</p>

2.4 Repository management

Blackboard Content System	Harvest Road Hive
<p>+</p> <p>Rights and a quota (Mb) can be assigned for each folder.</p> <p>The Content System cannot be linked to more than one LMS and it only works with one Blackboard installation.</p>	<p>++</p> <p>Rights and a quota (Mb) can be assigned for each folder. It is also possible to set the maximum size allowed for the folder.</p> <p>Within Hive, the highest level is a bureau, which allows you to create an unlimited number of categories. Each bureau has its managers and users. Users may have access to more than one bureau.</p> <p>Each bureau can be linked to an LMS, which means you can use one Hive server for multiple LMS servers.</p>

2.5 Versioning and tracking

Blackboard Content System	Harvest Road Hive
<p>+</p> <p>Version management is possible, for each new version the number is increased by 1 (from 1 to 2).</p> <p>Tracking: at the file level you can see what has been done to the file (e.g. change of rights, reading, writing). A log file is kept for each activity.</p> <p>The interface is very user friendly.</p>	<p>+</p> <p>Version management is possible. When uploading a new version you can choose between a minor (from 1.0 to 1.1) or major update (from 1.0 to 2.0).</p> <p>Tracking: it is NOT possible to see what has been done to the file at the file level, though you can see if there is a new version.</p> <p>Interface is not very user friendly.</p>

2.6 Check in / check out

Blackboard Content System	Harvest Road Hive
<p>+</p> <p>Files can be blocked temporarily, which means others cannot work on the file. In this system it is known as 'locking'.</p>	<p>+</p> <p>Check out: prevents others from using the file while you are working on it. You can also see who is using the file.</p>

2.7 Search & indexing content

Blackboard Content System	Harvest Road Hive
<p>+</p> <p>Search function is good.</p> <p>Basic and advanced searches are possible for both metadata and full text. In the advanced search function you can search metadata fields, though you have to provide a separate search term for each metadata set.</p> <p>Portfolios can also be searched, but only on metadata not full text.</p> <p>Search queries can be stored.</p>	<p>++</p> <p>Search function is very extensive.</p> <p>Searches can be across multiple metadata sets. Full text search is also available.</p> <p>The manager can adjust and expand the search function.</p> <p>Search queries can be stored.</p> <p>You can indicate for each document if it requires indexing; fillers (a, an, the) are filtered out.</p> <p>The list of fillers depends on the user's language setting. Specific content can be set so that it is not indexed, e.g. templates.</p>

2.8 Search & indexing metadata

Blackboard Content System	Harvest Road Hive
<p>+</p> <p>Searching metadata is possible, but there is no link between various sets of metadata.</p>	<p>++</p> <p>Searching metadata is possible and it is also possible to search across various sets of metadata.</p>

2.9 Classification of content

Blackboard Content System	Harvest Road Hive
<p>++</p> <p>The 'learning object catalogue' feature allows you to add and use taxonomy either manually or automatically. Items can appear in more than one category.</p> <p>File owners can submit their files for inclusion in the catalogue. The catalogue manager has to approve the inclusion for which you have to use an institution role (system admin have this role by default).</p> <p>Unfortunately the system only allows for one catalogue. Within the catalogue you can create up to a maximum of 50 main categories with an unlimited number of sub-categories and thus implement taxonomy.</p>	<p>+</p> <p>Standard categories in the Hive bureau may be used as taxonomy. Items may appear in more than one category. A user may place items in the categories to which he has rights. Users do not identify with this as quickly as taxonomy.</p> <p>Taxonomies can also be included in metadata sets, which make it easy to search on them.</p>

2.10 Backup, archiving & roll back

Blackboard Content System	Harvest Road Hive
<p>+</p> <p>Roll back of earlier versions of documents is available.</p> <p>The system can be set so that deleted files are kept for a certain period before being permanently deleted automatically. The setting is available per item (users, courses, communities, institutions, and library).</p> <p>If a user or course is deleted within Blackboard LS the relevant folder remains available in the Content System using the search function. The folder will no longer appear in lists.</p> <p>There is no archive database.</p>	<p>+/-</p> <p>Roll back of earlier versions of documents is available.</p> <p>Deleted files are deleted permanently; this can be changed at system level.</p> <p>There is no archive database.</p>

4.3 Workflow management

3.1 Workflow design tool

Blackboard Content System	Harvest Road Hive
<p>-</p> <p>Not possible</p>	<p>+/-</p> <p>A manager can create workflows in the system. Presentation is not graphic but text based and requires the completion of a form at every step. The greatest limitation is that it is not possible to copy an existing workflow, which means you always have to start from scratch.</p> <p>In the design you also have to create all the workflow teams involved, you cannot use existing groups. All in all, it is quite labour intensive and not very flexible even though a lot is possible. It is not possible to link to third party tools.</p>

3.2 Workflow management

Blackboard Content System	Harvest Road Hive
- Workflow consists of one step at a time. There are 6 different workflows in the application (review, grade, approve, share, remind, complete) which can be attached to several documents. There is also a summary of workflows sent and received. Workflows cannot be linked to form a process. Workflows may be applied to both content development and content management as well as in the learning process and when using portfolios.	+ Workflows consist of more than one step thus creating a process. You have to establish beforehand who will be involved in the process. Workflows may be applied to development and management of content. Hive is not meant to be used to manage the learning process or portfolios and the workflow does not apply to these. Workflows may be linked to an item type and enforce certain activities. It is easy for users to see in which workflows he participates and what is expected of him.

3.3 Routing

Blackboard Content System	Harvest Road Hive
+/- Is supported, but each step has to be initiated by the user; it is not a process.	++ If it is clear beforehand which work stream needs to be supported, Hive can make a workflow. Advanced routing with various branches is also possible. This allows you to create very advanced workflow schemes with multiple routes for items passing through the workflow.

3.4 Event handling

Blackboard Content System	Harvest Road Hive
- Users have to indicate this through the workflow 'remind' (per document or group of documents).	+ At each step of the workflow you can set when a user will be informed of something he needs to do or when he needs to get a reminder.

3.5 Approval & revision control

Blackboard Content System	Harvest Road Hive
+/- Users have to indicate this through the workflow 'approve' (per document or group of documents). There is a standard provision for items in the Learning Object Catalogue that works well.	+ A separate workflow can be created and set for the approval process for each the item type.

4.4 Publishing

4.1 Multi site management

Blackboard Content System	Harvest Road Hive
- No HTML conversion. A 'content pass' can be assigned to a document which allows for viewing of the document without having to log in. A time limit can be set. A users' institution role can be used to make content available to a user.	+/- HTML conversion: it is possible to place a Word document in the system and view it as an HTML. It is possible to place documents in the public domain which allows people to view it through a (public) website. A time limit can be attached. It is also possible to implement these types of settings at the bureau level. Templates make it possible to automatically show content from the system on a website.

4.2 Scheduled publishing

Blackboard Content System	Harvest Road Hive
- In the Content System you cannot publish an item for a limited publication period. Blackboard assumes that this is taken care of in the Learning System where you can add a begin and end date when creating a link to an item in the CS.	+ You can set the time each item has to be available for viewing for users in each category.

4.3 Multi channel publishing

Blackboard Content System	Harvest Road Hive
- No special provision in the Blackboard Content System	- Not possible in Hive except that files 'on the fly' can be converted to HTML. You can add templates to achieve this.

4.5 Usability

5.1 Administrator usability

Blackboard Content System	Harvest Road Hive
+ Management of the application is totally integrated with Blackboard LS, which means the manager is used to the way it works.	+/- Most administrative tasks can be done using the interface. The interface is the same as for the user and it is not optimal, however a lot can be done on the command line.

5.2 Developer tools, wizards, menus

Blackboard Content System	Harvest Road Hive
- Blackboard does not have special provisions specific to the Content System; some wizards etc are available in the Learning System. If you want to adjust or add something to Blackboard you need to create a Building Block. Currently there are no APIs for the Content System.	- As yet Hive has little to offer in this area. A very logical place for a wizard or graphic tool would be in the creation of a workflow, however this is not available. You can add templates to add or adjust features, a number of wizards could be made available for this, e.g. when limiting a search function to certain categories.

5.3 Client instructor and author usability

Blackboard Content System	Harvest Road Hive
++ It is very easy for users to use the application because of the integration with the Blackboard Learning System. It is fully integrated with the LS. The interface is comparable to the LS and like the LS limited adjustments are possible. The system is very intuitive, particularly if you know Blackboard. The same applies to management.	- Harvest Road has its own interface which is fully adjustable. The standard interface is not intuitive and standard users will need some training to be able to use it properly. Version 2.5 allows for full adjustment and comes with improved documentation. Managers need extensive training to understand the system and establish and maintain it properly.

5.4 Documentation, support & training

Blackboard Content System	Harvest Road Hive
+ The manual for the Content System is part of the complete manual of the Blackboard Academic Suite (LS, CS and Community System). The manual is comprehensive. An HTML version is also available which can be clicked in various places and refers you immediately to the right place in the manual. The documentation for APIs (which allow you to add features to the system) is limited. Blackboard International's office is in Amsterdam, which makes communication easy, although it sometimes takes them long to get back to you. Institutions that are already using Blackboard often already have the necessary contacts to get good support. There are already many organisations that offer training for Blackboard. The Blackboard Content System will be included soon. The Blackboard Users Group is very large and located all over the world. There is a lot of	+/- Hive's documentation improves with every release. The manual as such is quite well organised but because of the difficult user interface it is often hard to use. This has improved considerably in version 2.5. The manual is available on-line in HTML for quick reference. Documentation for programmers to make their own templates for instance is either not available or too limited. Support in the Netherlands is provided by Stoas. However they don't as yet have all the knowledge in house and often have to contact the supplier in Australia. Because of the time difference communication with Australia is never easy. Stoas can provide a number of standard training programs for Hive users. The Hive user group is still very small (certainly in the Netherlands). There are hardly any

knowledge available and this is distributed through all sorts of mailing lists and discussion forums.	opportunities to exchange information with other Hive users. Harvest Road is developing this. A large number of courses are being developed to address this need.
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5.5 Localisation

Blackboard Content System	Harvest Road Hive
+/- In the current version this is only possible at the system level. The choice is between English, Spanish, French and Italian. With the arrival of application pack 3 (April 2005) this can be set for each user or role. It is expected that application pack 4 will include Dutch.	+ Hive supports English and Spanish. You can choose one language or multilingual at the system level. The system has been prepared to accept more languages which can be added by the manager.

4.6 Standards & integration

6.1 Architecture

Blackboard Content System	Harvest Road Hive
+ Blackboard supports load-balancing and separate servers for file storage, database and application servers. Different configurations are possible depending on use. The University of Maastricht operates Blackboard in a load-balanced environment in Windows. In Delft Blackboard is running in a test environment with load-balancing on Sun Solaris. As soon as the use of the Content System increases performance collapses.	++ The technical architecture of Hive is good. Scalability and performance look good. A number of institutions are using Hive on a large scale already, particularly in Australia and Mexico. Harvest Road base their architecture on two central servers, a database and a file server, surrounded by various cache servers, which can be located de-centrally, e.g. two central servers for E-merge and a cache server in every institution.

6.2 Enterprise application integration

Blackboard Content System	Harvest Road Hive
+/- In Blackboard so-called snapshots of information can be loaded from other systems. Blackboard has a large number of APIs.	+ Information can be accessed through Hive using so-called agents. Java APIs are available to create links. Harvest Road also has a number of standard expansions for, amongst others, Blackboard and WebCT.

6.3 Database standards

Blackboard Content System	Harvest Road Hive
+/- The Blackboard database runs on Microsoft SQL and Oracle 8 or 9. Blackboard can be used with Windows, Linux and Solaris.	+/- The Hive database runs on MySQL and Oracle 8 or above. Hive is not suited to the Windows platform, but is suited to Linux and Solaris. From Version 2.6 onwards Hive is also suited to Mac OS X servers.

6.4 Directory standards

Blackboard Content System	Harvest Road Hive
+/- Blackboard can be linked to various directory standards, including Microsoft Passport, LDAP, Active Directory and Windows 2003 Webserver Delegation.	+/- Hive can be linked to any LDAP compatible directory, including OpenLDAP, Novell eDirectory and Microsoft Active Directory.

6.5 XML standards

Blackboard Content System	Harvest Road Hive
- There are no provisions for this in Blackboard	+ Hive can convert many different document formats into XML. Harvest Road uses the Verity technique for this.

6.6 Metadata standards

Blackboard Content System	Harvest Road Hive
+/- The Blackboard Content System comes with two standard metadata sets, IMS LOM and Dublin Core. It is also possible to add one personal metadata set.	++ Hive comes with a number of standard metadata sets, IMS, LOM, Dublin Core and SCORM. The manager can add an unlimited number of metadata sets. On top of that each bureau can have different metadata sets.

4.7 System management and security

7.1 Authentication

Blackboard Content System	Harvest Road Hive
+/- Internal and external authentication possible through different directory standards can also be done securely through SSL.	+/- Internal and external authentication possible through different directory standards can also be done securely through SSL.

7.2 Authorisation & Auditability

Blackboard Content System	Harvest Road Hive
<p>+/-</p> <p>Blackboard distinguishes a number of roles: Primary institution role Secondary institution role System role Course/community role</p> <p>All these roles can be used to assign rights to a folder and to items. The groups created within a course can also be used for this.</p> <p>The roles can be filled with users through LDAP links.</p> <p>Blackboard has extensive possibilities to log files at both the application and system level.</p>	<p>+/-</p> <p>In Hive you can use groups and roles. The difference is that a role cannot be part of another role. Groups within groups and roles within groups are possible. The roles can be filled with users through LDAP links.</p> <p>In Hive each bureau can set how things are logged, log files are also available at system level.</p>

7.3 Performance architecture

Blackboard Content System	Harvest Road Hive
<p>+</p> <p>Because the Content System is completely integrated with the Learning System, the same architecture can be used. Because load-balancing can be used the system is scalable.</p>	<p>++</p> <p>The Hive architecture allows for many millions of documents. Content can also be spread across more than one server, e.g. by bureau. Hive is very scalable because the architecture consists of a central data base and file server surrounded by a large number of cache servers.</p>

4.8 Cost & implementation

8.1 Pricing structure

Blackboard Content System	Harvest Road Hive
<p>+</p> <p>Cost of the Content System depends on the number of users.</p>	<p>+</p> <p>Cost of Hive depends on the number of users and the number of bureaus.</p>

8.2 Licence cost

Blackboard Content System	Harvest Road Hive
<p>-</p> <p>A separate licence needs to be bought for the Content System on top of the licence for the LS. Licence fees are set to increase over the next couple of years. There is not much we can do about that.</p> <p>We have a surf licence here.</p>	<p>-</p> <p>The licence fee for Hive is quite high, but Hive can be used for more than just an LCMS.</p> <p>We have a surf licence here.</p>

8.3 Implementation

Blackboard Content System	Harvest Road Hive
<p>+</p> <p>Implementation cost is limited because of the integration with the LS, because it is so user friendly and because the features are limited (but sufficient).</p>	<p>-</p> <p>Implementation cost is high, because a completely new system has to be installed. The system has so many features, that it takes a lot of time to set up. Making the templates certainly takes a lot of time.</p>

8.4 Maintenance

Blackboard Content System	Harvest Road Hive
<p>+</p> <p>Maintenance can be almost fully automated, such as cleaning up temp files and how long files need to be kept after they have been deleted by the user.</p> <p>Blackboard regularly issues updates and bug fixes, which makes it hard for the manager to decide when the system needs updating. That is because updates come with new features and bug fixes.</p>	<p>+</p> <p>Maintenance can almost entirely be automated and made to suit. When the system runs properly there is hardly any maintenance. Harvest Road does not issue too many intermediate updates and bug fixes because the system is thoroughly tested before it is issued.</p>

4.9 Miscellaneous criteria

9.1 Additional features

Blackboard Content System	Harvest Road Hive
<p>+</p> <p>Blackboard CS contains two additional built-in features:</p> <p>Portfolio - a digital portfolio system with broad application</p> <p>Virtual hard disk – offers users (lecturers and students) the opportunity to easily open, store and share files.</p> <p>These features are part of the Content System and are included in the delivery. This could be a disadvantage for an organisation that is already using a portfolio system. Building block technology is not available for adding additional features (APIs are not available).</p>	<p>++</p> <p>Hive does not come with additional features built in. There are however quite a few products that can be supplied free of charge:</p> <p>Reload (open-source) – arranging tool for learning objects.</p> <p>Hive Explorer – Java tool for easy upload and download</p> <p>Hive Rapid Publish for Word and Excel – directly open and store files from Word and Excel</p> <p>They are working on integration with an authoring tool Content-e. You can also make your own templates that allow collaboration between other products with Hive. Harvest Road themselves are involved in this and creates links on request.</p>

9.2 Organisation: availability of tools – knowledge and management

Blackboard Content System	Harvest Road Hive
The Content System is really geared to education and integration with Blackboard LS.	Hive's added value is most obvious when it is used for more than just education. This means that implementation and choice are much more comprehensive and that overlap with other systems can be much quicker.

9.3 Politics

Blackboard Content System	Harvest Road Hive
Many organisations already use Blackboard LS, so they are familiar with the Blackboard system. There is however also a large group that do not want to become too dependent on one supplier and that is where Hive has the advantage.	

9.4 Expectations regarding the future of the supplier and the product

Blackboard Content System	Harvest Road Hive
<p>+</p> <p>Blackboard is now a large business, which means that continuity is guaranteed, but that Dutch influence on the development of the product is limited. Blackboard has a very broad vision and no clear strategy for the future. New releases are marketed quickly with many mistakes.</p>	<p>++</p> <p>Harvest Road is now a mature business, which means that the structure and organisation of updates is well developed. Harvest Road has not chosen a specific educational concept, which means the Hive repository can be used in a broad range of applications all over the world, a strategy Harvest Road intends to stick to. The Dutch market is an important one for Harvest Road, because we choose high quality solutions which entails specific requirements that are of interest to Harvest Road.</p>

5. Cases

In the previous chapter we compared the two systems against a number of criteria; in this chapter we compare the systems in a number of case studies. In the studies we have only compared the most relevant criteria in each case. A number of cases (case 1 to 8) have been taken from the Quick Reference Cards for the use of Blackboard-Hive (Ingenluyff, van der Wilk, 2004) developed by E-merge for this purpose (see www.e-merge.nu). A number of cases (9 to 11) are the result of pilot studies within the educational E-merge project LCMS (OP1.1). The last case (case 12) relates to the objective of this project 'Exchanging Data'.

5.1 Case 1 – adding a document to a Bb course

The Media Centre of the University Medical Centre in Leiden (LUMC) makes all its digital and video material available through an LCMS. You want to publish an assignment in Blackboard. A picture of the Media Centre would be a valuable addition to the description of the assignment. You refer to this material from 'assignments' in your course stored in Blackboard.

Criteria	Content System	Hive
1.4: Metadata tagging	+	++
1.6: Link creation	+	+
2.1: Content storage	+	+
2.3: Special object management	+/-	+
2.5: Versioning & tracking	+	+
5.3 : Client, instructor and Author usability	++	-
6.6: Metadata standards	+/-	++
7.1: Authentication	+/-	+/-
7.2: Authorisation & auditability	+/-	+/-

Currently indexing of pictures and video material can only be done using metadata, not thumbnails. In Hive you can create a special search template to do this and the metadata options are also better than in Blackboard. In Hive, for example, you can create a special set of metadata for the pictures of specific video material. Blackboard only caters for one specific set of metadata.

In Blackboard it is easier than in Hive to refer to image material you want to use in a course.

5.2 Case 2 – using the same document in more than one Bb course

You are a French lecturer at a College and are involved in various courses. You have written a study manual that can be used by all the students in the various courses. If you only had Bb you would have to upload this manual for each individual course, consequently if you were to make a change to an item in the manual you would have to upload the revision each time you change it. In an LCMS the document would be stored in one place to which you refer.

Criteria	Content System	Hive
1.5: Link creation	+	+
2.1: Content storage	+	+
2.5: Versioning & tracking	+	+
5.3 : Client, instructor and Author usability	++	-
7.1: Authentication	+/-	+/-
7.2: Authorisation & auditability	+/-	+/-

In Blackboard the lecturer can easily use the document in more than one course. Blackboard automatically adjusts the reading rights so that students can actually view the document. In Hive the lecturer has to set this manually. Furthermore for lecturers Blackboard is much easier to use.

5.3 Case 3 – sharing documents with others

You are a lecturer in information management and you are the proud owner of a completed assignment that illustrates a fundamental issue really well. Wouldn't it be wonderful if you could make the document available to your colleagues in Delft and Maastricht? However, you are not happy when a couple of days later you discover a mistake in your email with attachment.

Luckily with an LCMS the document is stored in a central location and you make the change when you have a minute, because your colleagues will be referring to this document from Bb.

Criteria	Content System	Hive
1.5: Link creation	+	+
2.1: Content storage	+	+
2.5: Versioning & tracking	+	+
2.6: Check in / check out	+	+
5.3 : Client, instructor and Author usability	++	-
7.1: Authentication	+/-	+/-
7.2: Authorisation & auditability	+/-	+/-

Mistakes can be fixed in both LCMS without affecting the reference to the document in Blackboard. Because the interface with Blackboard CS is more user friendly, in this case the assessment favours Blackboard CS.

5.4 Case 4 – searching for a colleague's material

A colleague has used a table in a demographics course which would really suit your statistics course. Every lecturer has reading rights to the educational material within the institution, but you don't know where the document has been stored. With an LCMS you can immediately search for the document and make direct reference to it from your own Bb course.

Criteria	Content System	Hive
1.4: Metadata tagging	+	++
1.6: Link creation	+	+
2.7: Search & indexing content	+	++
2.8: Search & indexing metadata	+/-	++
5.3 : Client, instructor and Author usability	++	-
6.6: Metadata standards	+/-	++

Basic and advanced searches are possible in both Blackboard and Hive both for metadata and full text. When searching on metadata in Blackboard you have to submit a separate search criterion for each metadata set (e.g. IMS LOM and Dublin Core). In Hive you can search across metadata sets, which is particularly useful if you don't know which metadata set the author used. The search function is good for both packages but slightly better for Hive.

5.5 Case 5 – searching for relevant material

Subject oriented education is becoming increasingly prominent. Students need to acquire not only competencies in practical situations but also need to study background information. A student has asked you to help her in obtaining the ‘interview technique’ competency for the treatment of delinquent youths. The one month practical has been organised, now you need the literature ... The student’s assignment is to use an LCMS to find the educational material (available at various colleges and universities) and to submit the result to her supervisor for assessment.

Criteria	Content System	Hive
1.4: Metadata tagging	+	++
2.7: Search & indexing content	+	++
2.8: Search & indexing metadata	+/-	++
2.9: Classification of content	+	+
5.3 : Client, instructor and Author usability	++	-
6.6: Metadata standards	+/-	++

In Blackboard you can search directly in the Content System but you can also search the Learning Object Catalogue, the results you find in the Catalogue have already been approved by the Catalogue Manager, so they have been found to be relevant in a certain context. In Hive you only have one way of searching and so your search results may include untested items in terms of status and relevance. The nice thing about Blackboard CS is that lecturers can categorise literature relevant to his subject area and make it available to students. Students searching the catalogue will therefore only find relevant documents and will only have to decide which ones are the most relevant to their research.

5.6 Case 6 – establishing a community

You have a wonderful colleague in The Hague and the two of you have been asked to develop a new psychology course for a TAFE college. Leiden is also working on the subject but from a different perspective: they would like to be able to follow what you are doing. The Dean of the Psychology Faculty of the University of Amsterdam is also interested in the project and agrees to be the subject referee. In an LCMS you can create a project community and store all (draft) documents and memos so that some people can make changes and others cannot. It is also clear where authorised end-products are available for viewing.

Criteria	Content System	Hive
1.1: Integration with 3p tool for content creation	+/-	++
1.3: Navigation structure	-	-
1.4: Metadata tagging	+	++
2.1: Content storage	+	+
2.5: Versioning & tracking	+	+
2.6: Check in / check out	+	+
2.9: Classification of content	+	+
2.10: backup, archiving & roll back	+	+/-
4.2: Scheduled publishing	-	+
5.3: Client, instructor and Author usability	++	-
6.6: Metadata standards	+/-	++
7.1: Authentication	+/-	+/-
7.2: Authorisation & auditability	+/-	+/-

In both Blackboard and Hive it is possible to establish a project community with a number of people, where the documents created are stored in the content management system. Both systems cater for version management and a 'check in / check out' system ensures that only one person at a time can work on the document. Hive scores better when it comes to adding metadata because it has many more metadata sets than Blackboard CS. Hive also allows you to attach a publication date to a document. On the other hand Blackboard CS is more user friendly. When building a community a navigation (folder) structure is usually established for storage of the documents. This cannot be done from the publishing environment in either Hive or Blackboard, but is possible in the LCMS itself. Here the Blackboard interface is more user friendly than the Hive one. The difference becomes negligible when using Hive Explorer.

5.7 Case 7 – working together on the same document

If we go back to the example in case 6, you could have a set up whereby when you develop a draft document your colleague in The Hague gets an email. Once she has made her changes the dean receives an email. If he has no comment, he can indicate this and the document becomes available for reading by his colleagues in Leiden; if he does make changes, it goes back and forth until you all agree and only then will Leiden get an email to say that it is available to view.

Criteria	Content System	Hive
1.2: Collaborative authoring	-	-
2.5: Versioning & tracking	+	+
2.6: Check in / check out	+	+
2.10: backup, archiving & roll back	+	+/-
3.1: Workflow design tool	-	+/-
3.2: Workflow management	-	+
3.3: Routing	+/-	++
3.4: Event handling	-	+
3.5: Approval & revision control	+/-	+
5.3 : Client, instructor and Author usability	++	-
7.1: Authentication	+/-	+/-
7.2: Authorisation & auditability	+/-	+/-

Hive supports the creation of a workflow (process) for the development and assessment of documents. If the pre-defined process needs adjusting, the user cannot adjust it himself, however, and will have to ask the Hive manager to do it for him. Blackboard CS does not allow for the development of workflow processes, every step in the process has to be initiated by the relevant person.

Hive is the best option where a workflow process can be determined beforehand, even though setting up the process is quite time-consuming. Ordinary users will have to ask the Hive manager to do this for them.

Blackboard CS would suffice in the case of a simple workflow process requiring only a limited number of steps and where users are very clear about their responsibility.

5.8 Case 8 – making information available to large groups

The Dean of Students of the University of Leiden has a set of standard information for students lagging behind in their studies, e.g. information from the student manual, brochures etc. He would like to make them permanently available on line on the faculty intranet and he wants to be able to make

changes and amendments once only. In an LCMS the Dean can place all the information in a clear structure and make it available through the intranet.

Criteria	Content System	Hive
1.3: Navigation structure	-	-
2.1: Content storage	+	+
2.2: Bulk import & conversion	-	-
2.3: Special object management	+/-	+
2.5: Versioning & tracking	+	+
4.2: Scheduled publishing	-	+
4.3: Multi-channel publishing	-	-
5.3 : Client, instructor and Author usability	++	-

This is not the primary function of either system as you are using an LCMS as a (Web) Content Management System.

Another thing to bear in mind in this case is that the information in the LCMS is accessed through the intranet (or internet). Hive is more suited to this than Blackboard. Information in Blackboard CS can only be accessed through Blackboard LS and not through another application.

Documents can be made available to large groups in both Blackboard LS and Hive. If an author wants to change something in a document, it remains available to the users. In Blackboard CS you cannot create a separate user group, except if you use a course or a portal role. In Hive this is very easy. Blackboard CS's friendly user interface means that uploading large numbers of files and the creation of an orderly structure can be done by the Dean. Hive Explorer has a similar user friendly interface (resembles Explorer in Windows) which makes uploading of files easy as well.

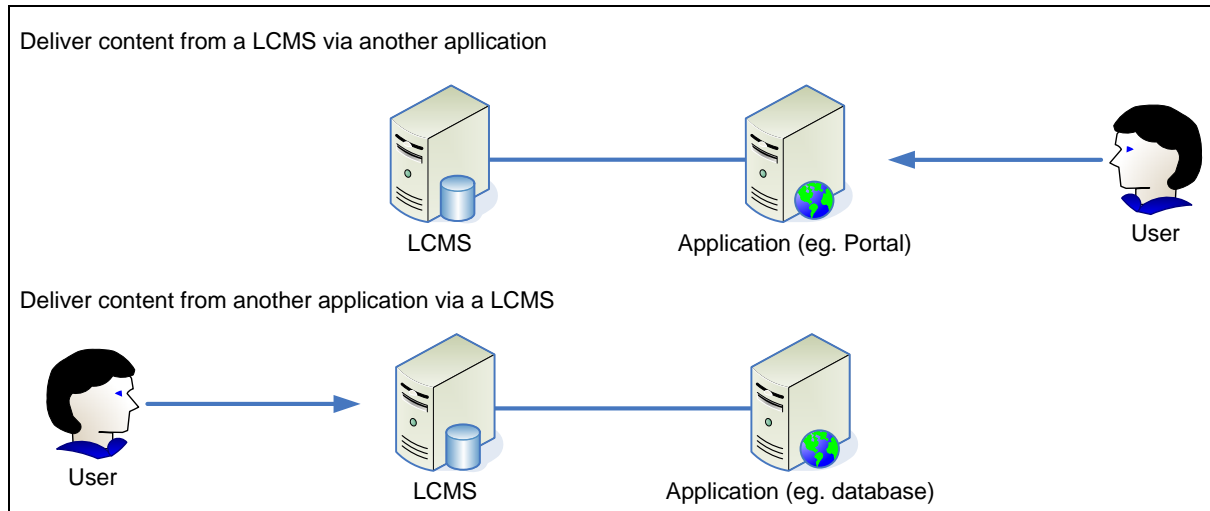
5.9 Case 9 – Bulk-upload of a collection of existing learning objects

Currently universities and colleges have many different systems for storing content, such as hard disks, email folders, Blackboard or even a CMS. Should the organisation decide to purchase an LCMS all content will have to reside in the LCMS. How easily is this achieved with an LCMS?

The content will not only be used for teaching using the Blackboard Learning System but will also be made available through the intranet, internet and other applications.

Criteria	Content System	Hive
1.5: Link creation	+	+
2.1: Content storage	+	+
2.2: Bulk import & conversion	-	-
2.4: Repository management	+	++
4.1: Multi-site management	-	+/-
5.3 : Client, instructor and Author usability	++	-
5.4: Documentation, support & training	+	+/-
6.1: Architecture	+	++
6.3: Database standards	+/-	+/-
6.4: Directory standards	+/-	+/-
6.5: XML standards	-	+
7.1: Authentication	+/-	+/-
7.2: Authorisation & auditability	+/-	+/-

Bulk upload is possible in both Blackboard CS and Hive. Hive is better at accessing information. Because Blackboard CS is totally dependent on Blackboard LS and can only function in collaboration with LS, the Content System does not really have features to make content available through other channels. Hive does have features which allow access to content in other applications. The situation described in the picture below can be achieved with Hive LCMS but not with Blackboard.



5.10 Case 10 – home study using learning objects

Students are asked to find suitable educational material from as many sources as possible. Students will be asked to categorise the information, add meta data and create a structure for it in the LCMS and then create a workflow process. This means the student has to indicate relationships between objects and has to establish a sequence. The result is to be submitted to the lecturer. Following his approval it will be made available to other students.

In this case students have become experts, comparable to lecturers developing learning objects which they store in a database, possibly together with a learning sequence.

Criteria	Content System	Hive
1.1: Integration with 3p tool for content creation	+/-	++
1.3: Navigation structure	-	-
1.4: Metadata tagging	+	++
2.1: Content storage	+	+
2.7: Search & indexing content	+	++
2.8: Search & indexing metadata	+/-	++
2.9: Classification of content	+	+
6.6: Metadata standards	+/-	++
7.1: Authentication	+/-	+/-
7.2: Authorisation & auditability	+/-	+/-

In Blackboard CS you cannot create a learning sequence. Students can place all sorts of documents in the CS and have them included in the learning object catalogue. This makes it available to other students but there is no relationship between the documents. Hive has a separate program for developing learning sequences called Reload. Students place all the relevant documents in the LCMS

(Hive) and use Reload to indicate relationships (sequence and relationships). Students can then publish this learning sequence in a SCORM / IMS package.

5.11 Case 11 – virtual knowledge centre

A virtual knowledge centre represents the public domain (internet) where scientific communities showcase their products (which have been checked for quality) and which contains a summary of and access to the scientific network of the domain. In a virtual knowledge centre part of the content is public and part has limited access. All the members of the community (libraries, companies, lecturers and students) can add and use content. A virtual knowledge centre is a portal that accesses information from different systems. Templates available through the portal are used to upload information, which means users don't work directly in the LCMS.

Criteria	Content System	Hive
1.1: Integration with 3p tool for content creation	+/-	++
1.4: Metadata tagging	+	++
1.5: Link creation	+	+
2.1: Content storage	+	+
2.3: Special object management	+/-	+
2.4: Repository management	+	++
2.7: Search & indexing content	+	++
2.8: Search & indexing metadata	+/-	++
2.9: Classification of content	+	+
6.2: Enterprise application integration	+/-	+
6.3: Database standards	+/-	+/-
6.4: Directory standards	+/-	+/-
6.5: XML standards	-	+
7.1: Authentication	+/-	+/-
7.2: Authorisation & auditability	+/-	+/-

The Blackboard Content System can only be used as a virtual knowledge centre by using the portal feature of the Blackboard Community System. Hive has a lot more features that make integration with portals and other applications possible.

5.12 Case 12 – How to use one LCMS for more than one educational institution

If you decide to purchase an LCMS then exchange of data between institutions is desirable. There are two scenarios:

- One central server that can be linked to all Blackboard servers.
- Each institution has its own server and all servers can exchange information, so that you can also find information on another server.

Important considerations are:

- User management, i.e. unique user names across all institutions
- (Delegated) management and Total Cost of Ownership
- Individual styles within institutions
- Individual decisions regarding use of features

Criteria	Content System	Hive
2.1: Content storage	+	+
2.4: Repository management	+	++
5.1: Administrator usability	+	+/-
5.2 : Developer tools, wizards, menu's	-	-
5.5: Localisation	+/-	+
6.1: Architecture	+	++
6.3: Database standards	+/-	+/-
6.4: Directory standards	+/-	+/-
6.5: XML standards	-	+
6.6: Metadata standards	+/-	++
7.1: Authentication	+/-	+/-
7.2: Authorisation & auditability	+/-	+/-
7.3: Performance architecture	+	++

Both systems should be able to deal with large scale implementation of an LCMS. Currently there is a lot more experience with Blackboard in this respect than with Hive. However, Blackboard LS is currently not suited to be linked to more than one Blackboard Learning System. More than one Blackboard installation can be used within the one Blackboard System (virtual installations) however this is not yet possible with Blackboard CS.

It is easy to link Hive to multiple Blackboard environments. Within Hive every institution has its own bureau which it can manage and adjust, e.g. own lay-out, metadata and item types. Users do need to be unique across the application.

The conclusion is that Blackboard CS is not suited for use in more than one institution.

6. Results

The Blackboard Content System is better if the only objective is simply storing and making available (learning) content within an educational institution, which is what is required in cases 1 and 2. The reason is that, this system is so well integrated with the known Blackboard system that 'client, instructor and author usability' which is what the system is so good at becomes the deciding factor.

Hive is functionally the better choice if there is a need to search for learning content (case 5) and where metadata plays a large part (cases 7, 10 and 11). Also when there is a need to develop workflows and routing schemes for collaboration of assessment/ratification projects (cases 5, 7 and 11) Hive would be the choice. Repository management, i.e. the management of multiple storage places with learning content is better with Hive than with Bb. If a document needs to be retrieved from an application other than the LCMS (another database) or has to be shown/published using another application (e.g. a portal / website, as in case 11), this is only possible using Hive. When more than one institution wants to use one LCMS and they want to approach this LCMS from their own Blackboard LS system (case 12), this can only be realised with Hive. The Blackboard Content System can only be linked with one Blackboard LS System.

Cases 3, 4, 6, 8 and 9 rely on material being made available to the/a broader public from various locations with varying read and write rights: there is not much to choose between the systems.

7. Conclusions and recommendations

The goal of this report is to compare two learning content management systems, Blackboard Content System and Hive. Both systems are integrated with the Blackboard Learning System. Both systems have been installed on the E-merge E-learning environment and can be used by users in E-merge. The most important question is which system is best? As this question is far too general, we have narrowed the question down to 'in which user environment should preference be given to which system'? To this end we described twelve case studies in which both systems have been compared. In a number of user environments Blackboard CS was found to be superior, in a slightly larger number of cases Hive would be the best choice, and in a number of cases there is not a big difference between them (refer paragraph 6). We summarise the results once again below, but from the product point of view.

Blackboard CS would be the best choice if:

- The only aim is the easy storage, management and making available of learning content within one institution.
- The system does **not** need to be used for the exchange of information with other educational institutions who would want access to it from another LMS.
- The use of a limited number of metadata sets (IMS LOM and Dublin Core) and one additional metadata set is sufficient.
- The use of a workflow **process** does not necessarily have to be managed by the system and developers and reviewers of content can set their own triggers after each step in order to initiate the next step.
- It is **not** necessary to make the learning content in the system available through a website, intranet site or other Blackboard LS application.
- The educational institution wants a ready made portfolio system and a virtual hard disk where students can have their own space to store documents.

Hive would be the best choice if:

- More than one institution wants to use the same (learning) management content system, e.g. to exchange learning content.
- The use of multiple standard metadata sets (IMS LOM, SCORM, Dublin Core) and the use of multiple specific metadata profiles (e.g. for a subject area) are necessary. There is no limit to the number of metadata sets or profiles.
- The system is not only used for learning content, but also for other content, such as images, accreditation documents, etc.
- Various workflow processes need to be supported, whereby the workflow has been entered into the system beforehand and the steps in the process are consecutively triggered by the system.
- Other sources of learning content are made available through the LCMS, e.g. the database of another educational institution or a library.
- The learning content in the system also needs to be made available through a website or intranet or other application.
- An open system is needed, that supports open standards and which allows for links with new applications.
- Within the institution there is enough knowledge to use templates to develop interfaces between Hive and other systems and Hive and users.

Summary

In educational institutions that use Blackboard LS, the problem is that learning content is stored in many different places and often exists in many versions. Material is hard to find and difficult to manage.

The Blackboard Content System can easily solve this problem. It is also possible to exchange content within the institution. The user friendly interface, very similar to Blackboard LS, should not pose any problem for the majority of Blackboard users. The fact that the Content System comes with a portfolio system and a virtual disk could prove to be an advantage.

Hive can also solve the problems mentioned above. However, the user interfaces are less similar to Blackboard LS, which makes it a bit harder to use. Should an institution be looking for a repository which allows for exchange of learning content with other institutions and which allows for the creation of links with other content databases and delivery has to be in applications other than Blackboard LS, Hive would be the best choice.

Future

Despite the fact that both companies are listed on the stock market, this isn't any guarantee for their future. Yanosky, Harris & Zastrocky of the Gartner Group (2004) expect that the e-learning market will stay unstable till the end of 2006. Blackboard tries to keep their customers by 'vendor lock-in'. Institutions are having more and more problems with the increasing licensing costs, which they have no control over.

Harvest Road has the strategy that they are independent of any LMS. This means that it is possible to store all your content in Hive and deliver it to different LMS's or to change to another LMS relatively easily, such as the open-source systems of Sakai (www.sakaiproject.org) or Angel (www.angellearning.com). Harvest Road is major supporter of the various standards, because this is essential for the simple connection with other systems.

8. Literature

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