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Learning in Process

D4.1 Analysis of the state of the art in object delivery platforms

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Executive Summary

Introduction

This report represents an analysis of the state of the art of the projects, technologies, products and systems that can be relevant for the design of advanced e-learning delivery environments.

Chapter 1 provides an introduction to the document and has a detailed explanation of the structure of the document.

Chapter 2 summarises the state-of-art of the e-learning projects and also discusses briefly about other projects that do not have their focus on e-learning.

Chapter 3 describes the technologies, systems and products that can be relevant to the design of an e-learning delivery system in the context of a research project.

Chapter 4 summarizes the overall findings and concludes.

Description of conclusions/results

The domain of e-learning delivery environment appears to be still very complex: An important number of projects in e-learning have been initiated; many technologies are involved in the design of such platforms; and many products, open-sources, commercial or internal systems have been elaborated.

No real convergence seems to really emerge, if we except some trends such as the progressive adoption of e-learning standards (and in particular SCORM), or the advent of more integrated approach (typically LCMS) trying to address in a same system both the authoring, the delivery and the administrative dimension of learning.

This overview of the existing e-learning projects and products has also shown that the potential of reusing other project experiences, or existing components (typically open source components), to be very difficult. Projects are often very specific, and do not seem in many cases to have reused themselves the other components that have been developed totally outside these projects (the only noticeable exception being one of a partner bringing component to the system). The reuse of open source systems appears very problematic, not only for technical reasons (these systems are very unstable) but also for economic reasons (the open source policy most of the time forbids any commercial exploitation).

Still, this report has helped to identify some interesting emerging approaches for the elaboration of e-learning platforms, and in particular the avoiding of developing everything from scratch (which many projects do):

This approach consists in the extension of non-virtual environments with learning delivery capabilities, as the one that has been adopted by the ITCOLE projects, which extends the BSCW platform in order to transform it into an e-learning delivery platform, or the .LRN project which extends the OpenACS virtual community system.

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1 Introduction

1.1 Objectives

This report represents an analysis of the state of the art of the projects, technologies, products and systems that can be relevant to the design of advanced e-learning delivery environments.

In particular, the objective is to help the work of the design of the delivery component of the LIP project in two ways:

1. Benchmarking: gaining knowledge from other projects that went into similar experiences (avoiding to redo the same errors or selecting solutions that proved to be successful) and
2. Reusing external components, and therefore avoiding reinventing the wheel.

1.2 Structure

The *first chapter* is an introduction to the purpose of the document and the structure of the document. (The chapter you are presently reading.)

The *second chapter* provides an overview of the e-learning projects and analyses them. Detailed investigation is conducted into the way the e-learning projects are developed. The usable output/components of the projects are identified and analyzed in this section.

The *third chapter* identifies the various technologies, products and systems that can be used in research projects. It also provides detailed information about various open-source systems, commercial systems, groupware, existing platforms, etc and summarises the analysis conducted on all the above listed systems.

The *last chapter* draws some conclusions related to the state of the art of the e-learning delivery platforms and provides a brief analysis related to the potentiality of a project that would aim at providing e-learning functionality to reuse existing work and ideas.

The *Annex* to this document contains detailed information about each of the projects, and technologies, mentioned in this document.

2 E-Learning Projects

2.1 Introduction

The objective of this section is to make an inventory of the research projects in e-learning and to conduct a brief analysis of the projects. The main focus of the analysis has been in investigating the following:

- Gathering information on how other projects proceeded with their work and in particular if they tried to continue from some existing work or started off developing something from scratch.
- To identify the main output generated by these projects and to find out if the output was available as open-source.
- To figure out the problems faced by the developers of these projects in order to avoid repeating the same errors.
- To list out the technologies used in various projects and to find out the most feasible solutions available.

Information about the various projects and initiatives has been gathered from various sources of information. First, the different dissemination sites that aggregate information on different research projects (such as K2, IST or PROACTe) have helped to identify the different projects that appeared to be relevant to the field of e-Learning, and have provided the initial information. Then the information web sites of the projects (referenced in the dissemination sites, or found with the use of search engines) that had been identified have been used to get more detailed information (in particular what were the technologies used by these projects, if these projects were built on some existing work, and if they finally had generated useful output). In some cases, the scientific papers referenced in these sites have provided useful information. In several cases the projects (such as AlphaNet, Coronet or InnoeLearning) produced state of the art analysis that they made publicly available, and that could be used for our analysis.

Still, this collection of information remains incomplete since:

Many projects are still under development and at present do not have yet generated some concrete result, or have yet to publish these results. For example, the ITCOLE project that is developing a new Web-based environment for collaborative learning and knowledge building is still in the development phase and has no usable output yet. This project promises to provide tools for community and team building, as well as awareness tools and tutor-ware by the end of the project. In a similar way, the ADAPT-IT project, which promises to build training design tools by the end of the project, is also still incomplete. This situation can however evolve rapidly. For instance, the Reload has very recently (beginning of November) made available a free and Open Source SCORM Player (as well as an editor). Before this, only limited information was available about the technicalities of this project.

Other projects that have been completed, and that therefore are not any longer into any development phase anymore, have not disclosed detailed technical information. For example, the KOD project, which has been completed in July 2002, has not provided an important amount of information concerning the technical output of the

project (a personalised training /learning system), although it has presented its results in conferences and journals via an extensive list of scientific papers. It has to be reminded indeed that all the results of research work is not necessarily open to the public, and in particular often retains some intellectual property right dimension.

Although the number of projects that have been analysed is quite large, it is still not an exhaustive list of projects. An effort has been made to include all the important projects that we have found to be interesting.

The details of each project are to be found in the annex of this document in: “6 Annexe 1: Projects”.

2.2 Projects addressing delivery with a strong personalization dimension

A number of research projects directly address the personalization (or contextualization) dimension of Learning, as it is the case in the LIP project. Examples of include the projects ADAPT-IT, AlfaNet, KOD, MOPLE, TRAIN.ME or CORONET. Each of these projects usually focus its attention and effort on a particular aspect of personalisation / contextualisation.

The KOD (Knowledge On Demand) project, which was completed at the end of 2002, represents an example of an adaptive platform delivering just in time learning objects. Within KOD Technology, the working engine is embodied by Intelligent Software Agents (IntellAgents). The KOD agents function as the knowledge analysing, monitoring, generating, adapting, delivering pulse of the system with advanced skills on user profiling, modelling and e-learning. As indicated previously, many scientific publications were done during the project related to personalize learning, which is a domain for which this project appears to be a pioneer. If some technical description of the architecture is available, no information appears to be available related to the prototype that has been designed (neither the source code of the system nor the access of the prototype is available. No screenshot of the system is available). Besides this systems do not seem to have been build on previous technical work.

The CORONET project, which was completed in mid 2002, represents another pioneering project that has addressed the question of the design of a personalized learning platform. The project, which was focused on collaborative and on-demand learning within Software Engineering corporate learning networks, include however a more important collaborative dimension, defining for instance different roles in the learning process. Contrary to the KOD project, the CORONET project has published its main prototype (WebMaster) as GNU Open Source.

A more recent project, the AlphaNet project (which will be completed in 2005), aims at providing individuals with new methods and services for active and adaptive learning. This project is working on a prototype of a LMS with intelligent personalisation capabilities and focused on continuous training needs in corporate firms. Machine Learning techniques and (user and educational) ontology will be used to achieve adaptation, in particular to construct dynamically the user model by the observation of the user's behaviours. Some information is available concerning this project that appear to share many of the objectives of the LIP project: this project is built on the work (systems) and the expertise of several of the partners as well of the work of Open source projects. In particular, AlphaNet relies on the technology /

system Edubox developed at the Open University of Nederland, and on the standard EML (Education Modelling Language) proposed by this institute, and the work the UNED is conducting on top of the .LRN open source Learning System (which is itself an educational extension of the GNU Open Source virtual community system OpenACS written in TCL). It is also worth to mention that even if the technical assets (prototype) generated by this project is not yet as clearly proposed to the community in Open Source as in the CORONET project, this situation could change because this project is using in some cases systems that are under the GNU License (it has to be reminded that in this case all the derived work as to become GNU). It has not also to be forgotten again that this project is also contributing to standards, via EML that has been submitted to IMS to cover the educational process dimension of Learning Objects.

The ADAPT-IT project (completed in the beginning of 2003) relies on the definition of a learning methodology for teaching Complex Cognitive Skills (such as Controlling air traffic or piloting an aircraft). It provides optimising software to personalise the selection of training tasks based on the “cognitive load” training models. Very little information however appears to be available on this tool (written in Java) that actually may only be used by course designers to help them design curricula adapted to the acquisition of a set of skill rather than a tool that dynamically adapt to the student needs.

The MOPLE project (Modular Open Platform and Tools for Personalised Learning in Computational Engineering) represents another IST project (completed in beginning 2002) that include a personalisation dimension and that aims at designing a system that can be used in an all range of application domains. The information provided about this project (and in particular what the personalization really means and how it is achieved) is however very vague: “By adaptive they mean that the application, by means of the tools provided in the MOPLE framework, can be adapted to the personal needs of the individual student. In fact, knowledge-based rules will allow the application to some extent to adapt itself to the needs of the individual students”. Some results seem however to have been achieved since this platform is being used as the e-learning platform of a research project (FIPSEE) related to the education for the Food Industry.

Another project to mention is the TRAIN-ME (Personalised learning on-demand and on-the-job) project, a one-year project that seems to have been designed using the learning platform of a relatively small partner, and for which almost no information is available.

Finally, it is important to mention that many of these projects have started by an in-dept state of the art of the existing work, and in some cases (CORONET and AlphaNet) have made this work freely available.

To summarize, projects have usually been able to develop personalised learning environments and learning tools, although in some case the notion of personalization has to be relativised.

Not surprisingly we can observe that more recent projects (ALPHANET) were able to start more often from existing work (which was more difficult from pioneering projects that had little to start with). These projects are also putting a stronger emphasis on the use of standards (that have reached now a better level of maturity).

All the projects that we have mentioned originate from Europe. Is the reason due to some bias in which this analysis was conducted which restricted the search to Europe? Actually we were able to identify only very few research projects with a strong personalization dimension in the other side of the Atlantic. The project VALA (Virtual Adaptive Learning Architecture Project) represent a system developed at the University of Arizona (and completed in mid 2002) that focuses on developing a learning architecture with user interface adaptability that provides a personalized learning environment for each learner. This system seeks to determine which learner variables (ability, cognitive style, learning style, and personality) are most productive as a basis for determining adaptive instructional strategies.

The reason of this under-representation of research of personalized learning in the US does not appear to be a lack of interest from the academic community, nor from the business / e-learning community: The next major worldwide conference on e-learning technology (the International Conference on Advanced Learning Technologies) has for main theme: “Crafting Learning Within Context”, which is exactly about adaptation and personalization. The main vision of the standardization group of the Masie Center (one of the most important think thank group in the domain of education in the US) is: “personalization” (see (S3 working group, 2003)). Perhaps can we attribute the answer to this question to the fact that the “e-learning industry” was particularly strong in the last few years (for instance, an extremely large number of LMS and LCMS have been elaborated (Chapman Bryan, 2003), (Brandon Hall Staff, 2003)) which has draw all the resources in the domain of e-learning.

2.3 Other projects relevant to the delivery dimension

Other projects can also be mentioned in the context of e-learning delivery, even if they do not include a personalisation dimension. These include the projects 5D, Dunes, EdComNet, ELENA, ITALES, ITCOLE, KNOWLABORATION, OASIS, PROMENTHEA, RELOAD, SCHOOL+, and VIDL.

These projects that design a learning environment, have usually a different focus from one another: some projects address only a particular aspect of delivery (learning network, collaborative learning, individual learning, experiential learning, on the job), whereas others only address delivery for some specific group of learner (school, universities, companies, the individual, the citizen).

Learning networks

For example, the main aim of the EdComNet, Knowlaboration and 5D projects is to provide support to learning networks. Delivery systems in these cases usually consist in the extension general virtual community delivery systems with more explicit support for the learning processes in a social context. In particular EdComNet aims to develop a virtual learning community Web portal for adult citizens, Knowlaboration aims to develop a fully personalised collaborative learning environment for organisations and 5D aims to develop a model system for creating new educational communities and organise collaboration between different schools.

Collaborative learning

Other projects like ITCOLE project that is developing a new Web-based environment for collaborative learning and knowledge building. The paradigm is the extension of a groupware platform (in this case the BSCW system) in order to transform it into an educational system. PROMENTHEA (renamed as PROMENTHEUS) aim at the

creation of collaborative learning support environments (very little information is available though on this project).

Personal learning assistants

A very different and interesting project is the VIDL project (Virtual Intelligent Distance Learning) in which artificial intelligence is given importance and a low cost, high quality, and completely innovative, artificial intelligence based approach is used to adapt to different levels of trainees in different ways. The Elena project aims to develop a system, which can manage the distribution and consumption of Learning Services via a Personal Learning Assistant. The project also investigates the concept of peer-to-peer learning via the use of the Edutella Peer-to-Peer technology, and has also a strong personalization dimension.

Experiential learning

The main aim of the ITALES project is to investigate the use of 3D virtual environment for learning. The delivery platform in this case usually consists in a multi-user 3D environment, in which the student is engaged in some role-playing simulation of situations. The Dunes project aims at investigating learning processes for acquiring soft skills based on dialog and argumentation. Many players in formal and informal learning environments and in workplaces throughout Europe would be using and testing this software.

Systems targeting a specific sector

Besides, various projects are developing virtual learning environments for a specific sector or community. For example, various projects are developing virtual learning environments to be used mainly by schools. Some of the projects that aim at developing VLEs for schools include ITALES, Oasis and SCHOOL+.

As indicated, all these projects design at some point a virtual learning environment. This objective is central in projects such as RELOAD, which aims at designing a global learning environment covering both the authoring and delivery of learning objects; the ITCOLE project, which objective is to transform the collaborative platform BSCW into a learning platform; the VLE project, which helped to further develop an commercial learning environment; or Elena which explore the use of many technologies to learning (semantic web, peer-to-peer, intelligent agents). Obviously these projects have a strong technological dimension, and are often built upon some existing technical infrastructure that they extend, and that they plan to reuse in the future.

The technical objective is more peripheral in some other projects such as Knowlaboration, EdComNet, ITALES, OASIS or SCHOOL+, which rather focus their attention on other aspects, such as social or learning dynamic in virtual environments, or on a specific sector (children education for instance). In these cases, these projects are often built using existing systems, but without the objective of capitalizing the results in a technological platform that will be reused in other contexts.

2.4 Other projects

Certain projects such as CELEBRATE or CUBER are focussed at creating or managing content and are not focussed towards e-learning delivery. An interesting

example in this context would be the project uPortal, which is a free, sharable portal under development. The aim is to help content developers to quickly get uPortal up and running and allow them to begin building content without wasting much time and efforts. Other projects that can be listed out in the category of content management include EduSource, Open Archives Initiative and MIT's Open Courseware. The ELSA project has developed an e-learning portal specifically dedicated for the automotive sector that offers training courses, course management functions, and a full suite of value-added services, supporting collaborative training sessions, online tutor guidance, and knowledge sharing.

Some projects are meant to address better the authoring of content and are not focused towards e-learning. These projects include CANDLE, DIOGENE, Easel and Trial-Solution. The output of these projects has not been found to be particularly interesting for this document and moreover in a couple of cases has been restricted to be used by the partners of the project only.

There are some other projects that are aimed at knowledge management, developing assessment tools, etc. The project KITS, develops and evaluates a learning environment that is an educationally supported distributed game in the domain of knowledge management (KM). ICIS is a project that aims at developing assessment tools that help in individual assessment and provides individual training based on the assessment.

The role of some projects and initiatives is not to generate new ideas and concepts, but to rather help in the aggregation of work.

2.5 Reusability

2.5.1 Are the projects built on existing work, and reuse existing components?

As we have seen from the previous sections, many projects appear to have been facing the same concern as the LIP project concerning the reuse policy to adopt when designing the platform. In a similar way, the different projects had to decide what could be their approach concerning the reusability of the systems they generated, and in particular the potential to reuse them in another context.

The answer to these concern vary considerably depending on the scope and objective of the projects, some timing issues, and their desire to exploit the results once the project has been generated. For instance the less technological projects were more inclined to built on existing systems, but without clear desire to exploit the technological output beyond the particular domain in which it was elaborated: Indeed these projects are not really generating intellectual assets at the technological level and therefore are less afraid to make some choices that can limit the exploitation of the technical infrastructure that they produce. More technologically oriented projects are very concerned at the intellectual property issues, and do not want to have the exploitation of their work limited in the future (for instance Open Source license can attach many strings to their use which can reduce considerably the potential of future exploitation). On the other hand, these projects are more interested to produce components that will have a high level of reusability. The timing issues are also an

element to consider: pioneers do not have a lot of existing technical infrastructure to start from; besides, the use of early standards can be considered as very risky (because of the complexity and immaturity of the first versions as well as their important evolution).

Perhaps, the better level of reuse appear to be in the following cases:

- The project reuses a technical infrastructure that one of the partner controls.
- The project reuses a generic infrastructure that is open, and not very core to the project (an example is the use of a virtual environment that is to be extended with learning capability)
- The project reuses a very delimited component (a typical example would be a SCORM player).

2.5.2 Are the projects generating reusable components?

Many projects are still under development and at present do not have anything concrete that can be talked of. For example: The ITCOLE project that is developing a new Web-based environment for collaborative learning and knowledge building, is still in the development process and has no usable output.

A complete study of the projects and the output generated by them has resulted in the following conclusions about reusability of tools/components.

- Not many of the projects are generating reusable tools/components that can be used by everyone in other projects.
- There are few projects that allow everybody to use the tools generated at the end of the project. For example: The CORONET project has developed a reusable tool called WebMaster, which is available as open source. The tool is available to anyone who wants to download it and use it. The RELOAD project is also generating Open Source components (with no string attached) in the form of a SCORM player.
- There are still other projects that have been aiming at developing reusable tools/components and are presently testing their tools. These projects will be making their tools available to the public at a later stage. For example: The Dune's project is presently developing a reusable tool, which will be available to the public soon. The partners are testing the Alpha prototype of the tool at present.

2.5.3 Summary table

The following table lists out various virtual delivery environments. If any tools are generated at the end of the project or if any tools have been used in the project for the development of the project, they are also listed out.

Name of the Project	Is the project reusing?	Reusable Output if any
5D	No tools have been reused.	No reusable tools at present.
ADAPT-IT	Its been developed from scratch using Java.	No reusable tools at present.
ALFANET	aLF and Edubox	Edubox
CORONET	No tools have been reused.	WebMaster
DUNES	No tools have been reused.	No reusable tools at present.
EdComNet	Reuses the ICDT - developed using Lotus Domino, Java and Sametime.	No reusable tools at present.
ELENA	Edutella peer-to-peer technology.	No reusable tools at present.
ELSA	It is based on a multilingual intranet-based platform named VLE.	No reusable tools at present.
ITALES	No tools have been reused.	No reusable tools at present.
ITCOLE	Adapts BSCW's workspace (Basic Support for Creative Work) to create the virtual learning spaces.	No reusable tools at present.
KNOWLABORATION	It is based on the internally developed technology Citron developed by PC-System.	No reusable tools at present. (<i>Citron is an internal system</i>).
KOD	No information available.	No information available.
MOPLE	No information available.	No information available.
OASIS		
PROMENTHEA/ PROMENTHEUS	No information available.	No information available.
SCHOOL+	No tools have been reused.	No reusable tools at present.
RELOAD	RELOAD is extending the VLE Colloquia.	A free open Source SCORM player (and an editor) is now available.
TRAIN.ME	No information available.	No information available.
VIDL	VIDL has been developed Internally and does not reuse.	EduTrain

2.6 Standards, Content Reuse Issues

From a technological point-of-view, most of the tools that are (or claim to be) e-learning are beginning to share pieces of software generated in or belonging to two different areas: the first is the Authoring area and the second is the Administration area.

The reuse of tools in these two areas is based on two main ideas. The first has to do with the content, learning material, knowledge, and so on that circulates and exists in the e-learning system. Little by little, content is becoming more relevant than the intelligence implemented in the e-learning system that administrates it. The quality of the learning material becomes paramount when evaluating and assessing the

capabilities of any e-learning system. It is not a matter of using pieces of software to deliver knowledge to those who need it, rather it is about providing the best possible knowledge to those who need it, when they need it, and the way they need it. Thus, there is the paradox that an element that seems to be external to the system (that is, the content) occupies a position of relevance. Quality content is what is demanded by all of the companies today that are buying e-learning systems, to the point at which investments made in content seem insignificant in relation to the initial investments arising for the expense of acquiring an e-learning system. On the other hand, the content was excessively expensive due to a lack of standards and specifications providing a set of 'common rules of the game'. Therefore, the content had to be built, almost by hand and to order, for each of the different systems existing on the market. The good content generate, quality material, could not be consumed in a system other than the one for which it was designed. The costs of building and rebuilding the same material, adapted to the functionality or peculiarities of each system, increased considerably. The organisation spent large amounts of money because of this, making their e-learning strategies unprofitable, generating costs greater than the traditional transmission of know-how.

Thus, it has become imperative to create standards and specifications that set basic, common rules to:

1. Generate content that is usable in any Learning Management System
2. Associate behaviour with the content so that it is possible to track user consumption
3. Establish standard browsing norms. This is related to criteria for reuse of parts that are independent of the material. In addition, criteria is set to be able to generate different content formats, such as linear consumption courses, conditioned by the users' actions, automatic adaptation of each student's profile and, most importantly, the ability to generate dynamic learning paths based on the performance level of each user while consuming the material.
4. Create mechanisms for adding and packaging individual content pieces to generate learning units for a higher entity. These are, for example, mechanisms to add different chapters while generating a complete course. Packaging makes it possible to import and export this content between different systems.

As you can see, the content itself is more relevant than the e-learning system that manages it. Among the major players in this field are the Authoring tools that have acquired the current de facto standards that are taking over the market. The most specific and widely accepted is SCORM. The new e-learning systems are being built to manage, distribute, import, export, and administrate content created by SCORM-compatible Authoring tools. Administrating this content refers to how this content interacts with the system and with the user that is consuming it. The content reaches a greater dimension, in the sense that it is not only content but interactive content, able to track the users' actions, send those actions to the Learning Management System, and act accordingly.

The new version 1.3 of SCORM broadens the spectrum of standard criteria used up to now, established in version 1.2. Among other things, SCORM version 1.3 sets the basic rules and standards that must be met to deliver the content. The delivery tools must be implemented so that they meet the standards of SCORM version 1.3. This makes it possible to deliver the content generated in SCORM format to be delivered in many different ways, following a set of specific, known standard rules.

The reuse of work and common tools among different e-learning systems is not centred on the reuse of pieces of software (though that is part of it), rather on the adoption of the SCORM standard for all of the components of the e-learning system.

2.7 Findings & Conclusion

So finally, should a project try to reuse the existing work? Should it produce result that could be easily reused in other projects?

The answer to this question appears to be more complicated than what we could imagine (why not to try to reuse as much as possible indeed?): the overview has shown that the information about the different projects and components they have generated is usually limited. Besides, when the information is available, some strings are often attached to this reuse (for instance all what is developed upon GNU Open source has to become GNU Open source). Also the question is then to be sure that the projects will also create by itself represents some unique assets, and do not limit itself to only aggregate existing assets generating therefore very little added value. Finally the question is to decide what should be exactly reused (it is indeed important to keep the control of what is considered as the most critical).

Several answers seem to emerge that could be relevant to the LIP projects:

- The reuse of critical components that one of the participant of the project control well.
- The adoption of standards that have reached a sufficient level of maturity (unless this standards represent the ore of the projects).
- The reuse of a layer that is complementary to the core work that is being done in the project (for instance, reusing a generic virtual environment infrastructure, or a very delimited component such as a SCORM player seems to be a good idea. Reusing a whole e-learning system is more questionable).
- The benchmarking with other systems (code, but also ideas).

3 Technologies, products & systems

3.1 Introduction

The objective of this section is to conduct an overview of the different technologies, systems and products (commercial or free) that could potentially be used to contribute to the implementation of e-learning delivery platforms. This overview will provide LIP information that will help the design process of the LIP e-learning delivery platform (LIP-VLE), and hopefully some components and systems that LIP will be able to reuse (allowing LIP not to design everything from scratch).

3.2 General technologies and products

The technologies used for designing e-learning environments do not differ from the technologies that are used to design other IT systems. For instance, the programming languages and frameworks used to design e-learning systems include both traditional technologies (such as Java & J2EE, Microsoft technologies such as .Net, or other approaches such as IBM Lotus Domino) used to design enterprise IT systems and script-based languages/technologies (such as PHP, Python/Zope, TCL, PERL or ASP) used to design web-based systems.

Similarly, E-Learning systems may also use more specialized middleware to facilitate the implementation of some of their features (such as “Lotus Sametime” for real time communication).

The reader is also recommended to refer “7 ANNEX 2: General Technologies, Frameworks” for a general description of these technologies and frameworks.

3.3 General Collaborative Virtual Environment Systems

Collaborative Virtual environment systems represent digital infrastructures which provide to groups of people the means to engage themselves into collaborative knowledge activities. The use and extension of such environments for learning purposes appear to be an interesting idea in the context of the design of a learning delivery platform.

The four major categories of related products that have relevance in considering technologies supporting knowledge collaborative activities are:

1. Knowledge repositories and knowledge portals
2. On line project spaces for team work
3. Community management
4. Knowledge exchange and expert finder tools

In the following sections of this chapter we provide an elaborate analysis of these four categories of knowledge sharing tools and some of the related products, which are already in the market.

The last section will present the different virtual environment platforms that have been developed by some of the partners of LIP. (INSEAD, CAS and META4)

“Annex 3: Knowledge Sharing Systems” provides a more general overview of the systems supporting exchange of knowledge in a community.

3.3.1 Knowledge repositories and knowledge portals

This is the mainstay of traditional knowledge-management systems. Addressing knowledge sharing between communities of learners moves the primary focus from information management to social structures, but it does not make traditional information-oriented concerns obsolete. Communities of learners/collaborators do produce and share documents and other knowledge artefacts, which can be put in electronic form, and which they need to manage effectively.

There are a large number of products in this area, ranging from simple facilities for sharing documents, to enterprise-wide information portals, to complex full-text search engines. This report does not attempt to cover the whole spectrum of products. A small sample is provided here to illustrate the kinds of issues associated with knowledge management systems. These sample products merely indicate what types of systems would be included here.

An important subgroup of knowledge management systems is knowledge portals. These are systems that aim at providing a full “portal” into the extended enterprise for the knowledge worker. They are intended to be these workers’ point of entry into their work, their projects, their teams, as well as their communities of practice, bringing together the different resources. Although many of these resources may lie outside the knowledge portal, it is the knowledge portal that provides the organisation, classification and search capabilities. In a collaborative environment, the interface is also the link to others in the knowledge-sharing community.

3.3.2 Online project spaces for team work

These systems provide an online space for a project team to conduct its work. They focus on project management, task scheduling, and management of the collections of project-related documents. While these systems are usually not designed with learning networks in mind, they contain many of the features necessary for a community to come together. As a result, some of these products could be used for knowledge sharing between communities. But there is a danger: because the technology is oriented towards tasks, task assignment, and task scheduling, it could create more of a team/learning relationship among participants.

3.3.3 Community management

These systems support tightly connected communities across organizations and their boundaries, including customers, suppliers, partners, and employees. They place the emphasis on interactional capabilities and often lack sophisticated repositories for documents. They do not necessarily attempt to create a sense of closeness. They often handle very large groups. Most of them were originally designed for managing websites with customer communities. (Many have e-commerce capabilities, for instance).

3.3.4 Knowledge exchange and expert finder tools

The systems in this section focus on providing sophisticated access to expertise. Many of the systems described in this report include facilities for “member profiles,” including “yellow pages” where members can describe their area of expertise and in some cases their preferences about how to be contacted. They often collect answers in banks of question/answer pairs to be accessed before turning to an expert. When they do have to turn to an expert, they attempt to use criteria such as general ranking, history of answers to questions in an area, or analysis of relationships to determine who is most likely to provide an answer. There is usually a way for the recipient of information to give feedback to the provider. These systems can be used to form (usually fairly loose) communities, both in the consumer area and among experts inside an organization. At the very least they are certainly relevant for the “help desk” aspect of a community of practice. But they can also lead to the formation of communities among people who ask and answer questions on a given topic.

3.3.5 Platforms Developed by the different partners of the LIP project

Some of the partners of the LIP project are developing virtual platforms that could potentially be considered as the base platform for designing a virtual learning environment.

These platforms include:

- A virtual community platform environment: ICDT (Developed by CALT, INSEAD)
- A groupware platform: TeamWorks (Developed by CAS)
- A knowledge Management platform: KnowNet (Developed by Meta4)

The description of these platforms is presented in: ‘8.2 Platforms Developed by the different partners of the LIP project’.

3.4 E-learning systems and products

3.4.1 Introduction

In this section, various open source systems, commercial systems and other non-commercial e-learning systems are analysed.

3.4.2 Open-sources systems

More colleges and universities are increasingly considering open-source software as a valid alternative to commercial products. It appears natural to investigate whether Open Source products can also be used in the LIP project in one way or another for the design of the delivery platform. However, several considerations will have to be taken into account for the decision to select such a platform. These include some of the following:

- The *first consideration* is related to the contribution of the LIP project to the body of knowledge of e-Learning: LIP is a research project, and not an integration project, and it should in particular generate new and original knowledge assets (documents and systems). Designing a learning delivery system represents an

opportunity for the project to generate new knowledge assets, whereas reusing existing systems limits this. Yet, the knowledge assets that have to be generated in LIP need to bring unique features, and in particular should not limit itself in the design of yet another system (reinventing the wheel).

- The *second consideration* is related to the exploitation of the results. The choice of the platform should not limit the capability of the project to exploit the results that it has generated. For instance, extending a platform using the GNU license will limit the commercial exploitation (all the work derived from GNU work becomes GNU).
- Another *important consideration* of course would be the capability of the selected platform to fulfil the needs of the project (eventually via the extension of the platform or by interfacing the platform with the other LIP components).

The following chapters present an analysis of a certain number of existing Open-source products, with a particular emphasis on the characteristics that are considered to be important for the LIP project.

These open source products have been identified using some directories of open source systems such as the UNESCO Free Software Portal and the TECFA guide.

3.4.2.1 Analysis and Findings

Some of the reasons that help us conclude why reusing the existing open source products and systems is difficult are listed out here:

- Certain tools like ClassWeb (which is a web site management system) do not contain the necessary features like grading or assessing or tracking. The features that the available web management systems have are very limited.
- Certain tools like “coMentor” provide students with a collaborative virtual environment with access to real time discussions, etc but, having been built to be operated only with a UNIX/LINUX based computer and also additionally needing a web server, make it a very inconvenient choice for being used.
- Licenses are a major issue for reusing the tools that many of the projects have developed. The software available to download can be modified only as per the terms and conditions listed out in the GNU license, which makes it a very uncomfortable choice.
- Certain tools like the LON-CAPA are found to be very less user-friendly and hence complicated to use.

3.4.2.2 Analysis of tools/open sources using Java for development

As Java is one of the most widely used technologies, we have added this section that provides an analysis on the various projects that have been using Java to develop open source products. Many such tools have been considered here and information has been provided about the usefulness of the tools, the problems associated with them, etc. Some of the tools that have been analyzed for this section include Colloquia, CourseWork (Stanford), eConf, eLedge Open Learning Management System, MIT’s Open Courseware and University of Michigan’s CHEF.

Please refer 9.3 Open Source Systems for more information about these tools.

Certain tools are developed as groupware products that are helpful in collaborative learning. These tools are however found to be less robust and still need more refinement. For example: Colloquia is one of the groupware tools developed with the above goals. Apart from not supporting Web publishing and lacking server software (thus making it inadequate for large deployments) it is also not very open and easy to implement.

There are also some tools that are developed as open source e-learning software. For example, eConf is a dedicated solution for delivering presentations and lectures over the web. It's features support more of an information delivery solution and are not good enough for course management. The tool is very less robust and hence needs to be improved by adding in more teaching tools.

Most of the tools developed as Open source are available for download with the GNU license. If any modifications/improvements are made to the tool, the new version of the tool is not the property of the person or group modifying the tool. It is automatically available under the GNU license. For example: eLedge is available to download with a GNU license.

3.4.3 Commercial systems

A very large number of commercial e-learning systems exist. For instance, the Brandon Hall LCMS report (Chapman, 2003) identifies over 70 LCMS (Learning Content Management Systems) products on the market. And the Brandon Hall LMS report (Brandon Hall Staff, 2003) has identified more than 140 LMS Solutions. Please also refer the document D1.4 "Available Market Technologies Study".

Detailed information about all the available products cannot be made available in this document and hence an attempt has been made to provide information about the most important products.

Various commercial systems have been studied for this section and it has been found that these commercial systems are very costly to use. These products are available with a commercial license. Some products are conformant to standards while others are not.

Please refer the Annex3, '9.4 Commercial Systems' for the description of the commercial products.

3.4.4 Other systems

A number of e-learning systems that are not open source, or commercial are worth being mentioned: they represent reusable components and systems that are continuously developed by organizations (typically by universities and laboratories), that constitute the capitalisation of their expertise. These systems are used in different research projects (for instance EC funded projects), and are progressively improved. These projects may be at the origin of new commercial products, or of open source systems.

For detailed information about these tools, refer to Annex2. (9.5 Other components.)

3.4.5 E-Learning Standards

E-Learning standards represent the opportunity to make systems that were developed independently of one another to become really interoperable. E-Learning standards have an increasing dimension in e-Learning systems (including e-learning delivery systems) as they have matured and are progressively stabilizing (although standards in e-learning systems are still evolving).

Several standards have been defined in the domain of e-learning and are managed by a few number of standardization bodies such as the IMS Global Consortium or the IEEE Learning Technologies Standards Committee (LTSC). The document D1.4 “Available Market Technologies Study” provides a small analysis of these standards, and the different issues that they address. For instance the SCORM standard addresses the question of the structural description of the Learning Objects that will be delivered in an e-learning virtual environment platform whereas the EML standard addresses the modelling of the educational processes that are to be supported by this platform.

For an elaborate description of SCORM please refer “9.2.1 SCORM (Shareable Courseware Object Reference Model)” in the Annex.

E-learning standards appear to represent a nice idea, but what is the real situation? Should we try right now to adopt them, and conform to e-learning standards? If so, a legitimate question to ask however, is to know to which extent these e-learning standards should be used now. Are e-learning standards for now and should be adopted now, or do they only represent a nice idea that will need sometime before becoming very useful, and really bring value?

An analysis of various projects and their conformance to standards helps us to arrive at the following conclusions:

- Majority of the e-Learning projects are developing their own tools that are not actually in conformance with the above-mentioned standards.
- Some projects are still in the development stage and are not mature enough to think of educational norms.
- Some projects are really committed towards standards and try to adopt the educational norms set by the standards.

Still, and how indicated by the Elliot Masie S3 working group (the “Making Sense of Learning Standards and Specifications” group), We now have some fully accredited standards such as those for Learning Object Metadata, Content Packaging, and others from the IEEE Learning Technology Standards Committee, and the question is no longer to decide if standards should be used but rather to determining how they will be implemented. (S3 working group, 2003).

Finally, it is worth to mention some initiatives, such as the OKI Open Knowledge Initiative described in the annex, which aims at contributing to the standardization of e-Learning systems architectures, and in particular the interoperability of e-learning components.

4 Main Findings and Conclusions

The domain of e-learning delivery environment appears to be still very complex: An important number of projects in e-learning have been initiated; many technologies are involved in the design of such platforms; and many products, open-sources, commercial or internal systems have been elaborated.

No real convergence seems to really emerge, if we except some trends such as the progressive adoption of e-learning standards (and in particular SCORM), or the advent of more integrated approach (typically LCMS) trying to address in a same system both the authoring, the delivery and the administrative dimension of learning.

This overview of the existing e-learning projects and products has also shown that the potential of reusing other project experiences, or existing components (typically open source components), to be very difficult. Projects are often very specific, and do not seem in many cases to have reused themselves, other components that have been developed totally outside these projects (the only noticeable exception being one of a partner bringing component to the system). The reuse of open source system has appeared very problematic, not only for technical reasons (these systems are very unstable) but also for economic reasons (the open source policy most of the time forbids any commercial exploitation). Java-based Open Source systems do not have indeed strings attached (for instance the WebMaster developed by Coronet has a GNU licence) exist but are very few (examples include Bodington, or RELOAD SCORM player). However, as indicated, adopting a system that already has a strong support of the educational dimension may not be the best strategic choice: these systems usually impose an educational model that make difficult their use for an application in another context (and the supported educational model usually represent one of the core element investigated in a research project).

Still, this report has helped to identify an interesting answer to this concern (avoiding to have to redevelop everything from scratch – which actually many project still do), and has been adopted by several projects for the elaboration of their e-learning platform:

This approach consists in the extension of non-learning virtual environment with learning delivery capabilities. This virtual environment can be in some case Open Source (for instance the .LRN project which extends the OpenACS virtual community system) or not (for instance the ITCOLE projects, which extends the BSCW platform in order to transform it in a e-learning delivery platform).

This way, the e-learning project has the possibility to focus its effort on developing its core dimension (related to learning) with the maximum power and flexibility, without having however to have to reinvent everything (the non-core dimension of the project is reused).

5 References

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- S3 working group (2003), “Making Sense of Learning Specifications & Standards: A Decision Maker's Guide to their Adoption - 2nd Edition”, The MASIE Center, November 2003.

Besides, several resources have been used for collecting the information related to the research projects:

Information Society Technology:(IST) <http://www.cordis.lu/ist/projects/projects.htm>
Knowledge Square:(K2) <http://www.know-2.org/index.cfm?PID=41&action1=list>
PROACTe: <http://www.proacte.com/>
elearningeuropa.info <http://www.elearningeuropa.info/>
El.pub <http://www.elpub.org/>
The Diffuse Project <http://www.diffuse.org/>

Information related to the open source e-learning platform where first identified from:

Portals Pointers @ TECFA, Educational platforms
<http://tecfa.unige.ch/guides/portals/pointers.html>
UNESCO Free Software Portal
http://www.unesco.org/webworld/portal_freesoft/Software/Courseware_Tools/

6 Annexe 1: Projects

6.1 Dissemination Projects

6.1.1 eLearnTN (IST-2001-37440)

Abstract

eLearnTN

e-Learning Thematic Network

IST-2001-37440

Start 01/09/2002

End 01/12/2003

<http://inf2.pira.co.uk/factsheets/inform/et/eleartn.html> (not responding)

Description

The objective of this project is to prepare the bases for the creation of a wide international research group able to confront, in short term, the new challenges that the adoption of the new technologies will suppose in the field of the distance high education.

6.1.2 K2 (IST-2000-25017)

Abstract

K2

Knowledge Square: Knowledge sharing between technology enhanced learning research initiatives

IST-2000-25017

Start: 01/10/2001

End: 30/09/2004

<http://www.know-2.org/>

Description

The K2 action aims at the following objectives:

- Help the projects to identify knowledge and experiences that are likely candidates for collaboration and sharing (i.e. issues, knowledge gaps, lessons learned, best practice) capture these and capitalise on these.
- Optimise knowledge sharing between funded projects by preventing the duplication of research efforts and accelerating knowledge creation and distribution.
- Support the projects in disseminating the results of their work to a wider (scientific, industrial and public) audience, and
- Support the emerging community of practice on education and training technology.

6.1.3 LCCN (IST-2001-33539)

Abstract

LCCN

Learning Citizen Cluster Node

IST-2001-33539

Start: 01/12/2002

End: 31/01/2005

<http://www.learningcitizen.net/>

Description

The project aims to raise awareness of potential adopters of the technology developed, to bridge the gap between technology suppliers and users, and to exploit synergies between activities within the cluster to disseminate knowledge and results from the IST programme at all levels particularly for the LC projects. It also promotes collaboration and information flow amongst the projects and contributes to the raising of the quality of the projects' work and outputs Co-ordination.

6.1.4 PROACTE (IST-1999-12292)

Abstract

PROACTE

PROMoting Awareness and Communicating Technologies in Education

IST-1999-12292

Start: 01/01/2000

End: 31/12/2002

<http://www.proacte.com/>

Proacte is now closed, and the web site is no longer updated. Please see the website of Cordis for updated information about European funded projects.

Description

PROACTE is a service to communicate work funded by the European Union under the Education Area of the Information Society (IST) Programme.

Output (State of the art)

Report on Open Platforms and Tools for Personalised Learning: "Open Platforms and Tools for Personalised Learning: An overview for potential end-users" - November 2002.

Report on Advanced Training Systems: "Advanced Training Systems at Work: An overview for potential end-users" - October 2002.

6.1.5 UP-ARIADNE

Abstract

UP-ARIADNE

Open E-Learning Platform, a Community of Educators

IST-1999-20407

Start: 01/03/2001

End: 29/02/2004

<http://www.ariadne-eu.org/>

Description

Objectives: To prove the viability and assist during take-up and expansion of the ARIADNE Foundation: this non-profit association endeavours to exploit the results of the two-phases of ARIADNE, a successful European RTD project, namely a suite of authoring tools, an open E-Learning platform and an EU-wide repository of re-usable learning objects.

Output

Open E-Learning Platform, a Community of Educators and a European Knowledge Pool of Re-usable Learning Objects.

Note: Mainly focused on authoring tools.

6.2 Projects Comprising a Virtual Delivery Environment

6.2.1 5D (IST-2000-25435)

Abstract

5D

5th Dimension - Local Learning Communities in a global world

IST-2000-25435

Start 01/04/2001

End 31/03/2004

<http://www.5d.org/>

Description

The aim of the 5D project is to develop a model system for creating new educational communities and to design multimedia components that can be used to build them. The new system will facilitate learning that is independent of time or place. The name Fifth Dimension (5D) refers to the fact that education and learning go beyond the three dimensions of physical space and the fourth dimension of time. 5D is about making learning meaningful. The Fifth Dimension (5D) is an environment of learning, research and play. Collaborative and reflective learning is characteristic and so are the use of multifarious tools and the mix of participants. Collaboration is organised between different school institutions and school levels. Children, as well as undergraduates, researchers and teachers, have in 5D opportunities to find out new ways of teaching and learning.

Target users: Schools.

Technology/Prototype:

Technology used: Active Worlds Virtual Reality technology.

(<http://www.activeworlds.com>)

Reusability

No clear evidence of any software components that can be easily reused for the design of an e-Learning delivery environment.

6.2.2 ADAPT-IT (IST-1999-11740)

Abstract

ADAPT-IT

Advanced Design Approach for Personalised Training, Interactive Tools

IST-1999-11740

Start: 01/03/2000

End: 28/02/2003 (Completed)

<http://www.adaptit.org/>

Description

The ADAPT-IT project will provide ICT-based training design tools to guide the training designer according to the latest cognitive science and standardisation principles. Two cognitive principles will be central to the proposed method:

- Personalised training based on “cognitive load” training models and
- Integration of knowledge and skills.

Technology/Prototype:

An adapt-IT tool is a specific Java application that has been developed for this project.

Reusability

No information is available about the possibility of reusing the Adapt-IT in other context.

6.2.3 Alfabet (IST-2001-33288)

Abstract

Alphanet

Active Learning For Adaptive InterNET

IST-2001-33288

Start: 01/05/2002

End: 30/04/2005

<http://www.softwareag.es/alfanet/>

<http://learningnetworks.org/>

Description

ALFANET aims to provide individuals with new methods and services for active and adaptive learning. One of the outputs is a working prototype of a LMS with intelligent personalisation capabilities and focused on continuous training needs in corporate firms.

Technology/Prototype: EML/EduBox

The Alphanet project has conducted a relatively in depth-study on existing standards (Alphanet Project, 2003) and on state of the art e-learning related technologies (Alphanet Project, 2002).

This analysis has led to the following choices:

- The incorporation of the existing platforms (aLF and Edubox).
- The need to adhere to standards.

Edubox and aLF are described in the e-learning products section.

aLF (active Learning Framework)

It is a platform that has been developed at UNED in order to support the requirements for collaborative work. It is built upon the ArsDigita Community System, a multiplatform and open source set of tools for constructing web-based applications. It is made up of a web server connected to a relational database and a set of TCL (Tool Command Language) scripts allowing management of the interaction with the data model.

Edubox

Edubox is a flexible platform. The basis for this flexibility is EML (Education Modelling Language). EML provides the tool to developers to convert their educational and didactical ideas and views to digital learning materials. Learning materials and activities are coded in EML.

Practically, Edubox provides a complete electronic environment that assists guides and supports management, authors, teachers and students, in educational, didactical and management aspects.

Alphanet relies on the technology / system EML Toolbox that is being developed at the Open University of Nederland (<http://www.edubox.nl/>).

Reusability: Limited

The component Edubox which would appear as a good candidate for reuse do not seems to be available outside the Open University of Nederland. The standard EML (Educational Modelling Language) supported, has been submitted to IMS as a standard, and can be considered for reuse.

References

Alphanet Project (2003), Deliverable D31 – Existing Standards Analysis, January 2003.

Alphanet Project (2002), D12 State-of-the-art of Related Technologies, October 2002.

6.2.4 CORONET (IST-1999-11634)

Abstract

CORONET

Corporate Software Engineering Knowledge Networks for Improved Training of the Workforce.

IST-1999-11634

Start: 01/02/2000

End: 30/04/2002

<http://www.iese.fhg.de/coronet/>

Description

CORONET defines an innovative use of Internet technology to acquire, store, structure, transfer, share and exchange human knowledge in a working environment.

WBT-Master is not only a platform to have some kind of framework for online courses, but it performs comprehensive communication, collaboration and knowledge management features.

Technology/Prototype: WebMaster specifically developed (Open source)

The Coronet project has conducted a study on Learning Management Systems & Authoring Tools (CORONET 2001). WebMaster, a prototype has been designed in this project.

Useful Output: Open Source Technology (WebMaster)

The WebMaster system is now proposed as an open source (see the description of WebMaster on the open source section).

References

CORONET 2001, CORONET State-of-the-art Report on Learning Management Systems & Authoring Tools, March 2001.

6.2.5 DUNES (IST-2001-34153)

Abstract

DUNES

Dialogic and argUmentative Negotiation Educational Software

IST-2001-34153

Start: 01/03/2002

End: 31/08/2004

<http://www.dunes.gr/>

Description

The DUNES project will result in a methodology and in software tools to enable collaborative learning and the acquisition of "soft skills" through Internet-mediated discussion, argumentation and social interaction. The project will involve broad implementation, testing and validation in a "large-scale experiment" to be carried out by many players in formal and informal learning environments and in workplaces throughout Europe.

Technology/Prototype: Specifically developed

A prototype has been specifically developed.

The focus of this prototype is the support for the argumentation (and is based on the concept of the collaborative design of argumentative maps).

Useful Output:

The objective of the Dunes system is to develop an innovative "discussion space", featuring dynamic "discussion maps" for modelling and supporting discussion accessible both synchronous and asynchronously. The alpha prototype of the Dunes system is presently available only to the partners and is being tested for its basic use and characteristics.

6.2.6 EdComNet (IST-2000-26037)

Abstract

EdComNet

A humanistic Urban Communal Educational Net IST-2000-26037

IST-2000-26037

Start: 01/01/2002

End: 31/12/2004

<http://www.edcomnet.net/>

Description

EdComNet looks to develop a virtual learning community Web portal for adult citizens and focuses on lifelong learning. The ultimate objective of the project is to design, develop and implement a virtual platform for communal learning and communication in a community. This virtual platform is based on guidelines stemming from the integration of two categories of theories: autonomy oriented education, and the methodology of autonomy oriented tutoring stemming from it, and theories about self-organising social groups.

Technology/Prototype: based on ICDT (Lotus Domino)

Technology: ICDT. (Lotus Domino based)

A virtual community technology developed using Lotus Domino, Java and Sametime (for synchronous communication).

Useful Output:

This project is still under development, and no result is yet available.

6.2.7 ELENA (IST-2001-37264)

Abstract

ELENA

Creating a Smart Space for Learning

IST-2001-37264

Start: 01/09/2002

End: 28/02/2005

<http://www.elena-project.org/>

Description

A Smart Space for Learning is a system, which aims to manage the distribution and consumption of Learning Services via a Personal Learning Assistant.

In Elena, Edutella peer-to-peer technology is used to connect heterogeneous kinds of educational nodes. An educational node refers to a system component of a smart space for learning, which facilitates the provision of a learning service. In Elena educational nodes are realized as Edutella peers. The P2P infrastructure is used to announce the availability of learning services, search for evaluation service providers or obtain the reputation rating of a particular learning service provider. On top of the

P2P interfaces educational nodes offer interfaces for contracting and consuming learning services. These interfaces are part of the learning management network.

Technology/Prototype: Based on Edutella (Open source java)

Edutella peer-to-peer technology.

Useful Output

ELENA will set up an operational learning services network based on an interoperable communication infrastructure between heterogeneous peers and devices. This new smart learning space is most beneficial for learners since it opens a much wider spectrum of learning possibilities. For the future creation of such smart learning spaces best practice guidelines will be released.

(No information available at present about the tools available for reuse.)

6.2.8 ELSA (IST-2000-29340)

Abstract

ELSA

E-Learning Solution for Automotive SMEs

IST-2000-29340

Start: 01/09/2001

End: 30/04/2003

<http://elsa.clepa.com/>

Description

The ELSA project aims to demonstrate the added value, for supply companies operating in the automotive sector, of the innovative e-Learning and training portal ELSA. It is based on the multilingual intranet-based platform named Virtual Learning Environment (VLE) developed by the ESPRIT TQM-online project. It offers training courses, course management functions, and a full suite of value-added services, supporting collaborative training sessions, online tutor guidance, and knowledge sharing.

Technology/Prototype: Based on VLE (previous EC project)

ELSA is based on the multilingual intranet-based platform named Virtual Learning Environment (VLE) developed in a previous (ESPRIT) EU-funded project, named TQM-Online.

Useful Output

The output of the project will be an innovative, customisable e-learning portal that will offer training and services to companies operating in the automotive sector. No useable tools are downloadable as of now.

6.2.9 ITALES (IST-2000-26356)

Abstract

ITALES

Innovative Teaching And Learning Environments for Schools

IST-2000-26356

Start: 01/07/2001

End: 27/06/2004

<http://www.LTScotland.com/itales>

Description

The overall aim of ITALES is to develop a European wide virtual teaching and learning community that will enable teachers to share and re-use digital learning content, and allow both teachers and their learners to work together with the support of several innovative tele-presence/communication tools. Within the e-Community, learners will be able to follow e-Learning courses prepared by their teachers using the ITALES authoring and content management tools. The ITALES system will also provide a central repository containing digital learning content that teachers will be able to access for building courses for their learners. In addition to course customisation, teachers will also be able to configure the Web-based 3D virtual learning environment, both visually and functionally, to suit the needs of their learners.

Target Users: School

Technology/Prototype: Specifically developed

ITALES is developing a web-based 3D virtual customizable teaching and learning environment.

Useful Output

The learning environment will contain innovative authoring tools for teachers, content management tools for teachers and tools and courses for learners. Demonstration prototype versions of the teaching and learning environment, together with the teacher authoring tools and content management tools, when ready for use will be accessible at http://www.itales.ltscotland.com/itales_frameset.asp?s=3&sub=1.

6.2.10 ITCOLE (IST-2000-26249)

Abstract

ITCOLE

Innovative Technology for Collaborative Learning and Knowledge Building

IST-2000-26249

Start: 01/04/2001

End: 31/03/2003

<http://www.euro-cscl.org/site/itcole/>

Description

The ITCOLE project is developing a new Web-based environment for collaborative learning and knowledge building. The ITCOLE system will be a shared electronic workspace that students and teachers can use for asynchronous and synchronous collaboration. The system will provide tools for community and team building, as well as awareness tools and tutor ware. The new system will provide users and their tutors with real-time information on several aspects of collaboration and will help them to manage the process of knowledge building. The new system will be based on innovative and practical learning models developed as part of the project. A working

prototype for this next generation CSCL system will be evaluated on a large scale and the ITCOLE software will be made available free of charge to educational institutions, under open source terms.

Technology/Prototype: BSCL = BSCW + extended

The technological approach consists in the extension of the BSCW groupware platform (written in Python), and the introduction of synchronous technologies (written in java).

Useful Output

As a result of project's activity, by the end of the project, all European educational institutions will have an opportunity to install and deploy a web-based educational platform along with guiding pedagogical principles, both of which will be verified with pedagogical research during the project's life.

No useful / reusable components available as of now.

6.2.11 KNOWLABORATION (IST-2001-32505)

Abstract

KNOWLABORATION

Knowledge applications for collaborative organisational networks

IST-2001-32505

Start: 01/04/2001

End: 31/01/2004

<http://www.knowlaboration.net/>

Description

KNOWLABORATION represents an integrated end-to-end e-Learning solution. The tool-set (providing a Learning Management System module) will be a fully personalised environment (in terms of colours, pages, layout, modules) incorporating state-of-the-art individual learning styles techniques as well as dynamic, on line support and assessment tools in a scaling mode. The system will deliver course management tools, online tests and assessments and a dedicated resource area that enables instructors to provide their students with course materials on the Web.

Technology/Prototype: (PC Systems Citrus product)

Technology: PC Systems Citron, Greece (proprietary product).

Citron:

The CITRON Corporate Portal platform by GLOBO TECHNOLOGIES S.A. will satisfy the project's implementation needs.

Useful Output:

The Knowlaboration system is based on the internally developed technology Citron developed by PC-System (no possible reuse).

6.2.12 KOD (IST-1999-12503)

Abstract

KOD

Knowledge On Demand

IST-1999-12503

Start: 02/04/2000

End: 30/09/2002

<http://www.kodweb.org/> and <http://kod.iti.gr/>

Description

The main idea behind the KOD project is the creation of a vertical learning portal (VLP), which can support

- Back-end users (tutors, authors, publishers, intermediators, brokers, etc) to design, develop, modify, publish, search, retrieve, broker, interchange and re-use adaptive educational e-content, and
- Learners to access educational e-content in a personalised way.

Technology/Prototype

No information available as yet.

Useful Output

Updated information about the status of the project is not available. The project's website was last updated in July 2002.

6.2.13 MOPLE (IST-1999-13460)

Abstract

MOPLE

Development of Modular Open Platform and Tools for Personalised Learning in Computational Engineering

IST-1999-13460

Start: 01/04/2000

End: 31/03/2002

<http://www.cimne.upc.es/projects/mople/>

Description

The main objective of this project is to develop an innovative integrated, open learning platform (the MOPLE framework) based on state-of-the-art Internet, and multimedia technology, and to implement, validate, and disseminate a computational engineering learning application (a MOPLE application) based on the MOPLE framework, sophisticated engineering simulation programmes, available educational software, and components which will be developed during this project.

Technology/Prototype

No information appears to be available.

Useful Output

Little information appears to be available.

The MOPLE system however is going to be used in the FIPSEE (Food Industry Problem Solving Electronic Environment) IST project, to provide the modular

platform allowing the introduction of different courses regarding food processing technologies and simulation and optimisation techniques.

6.2.14 OASIS

Abstract

OASIS

Open Architecture and Schools in Society

IST-2000-26216

Start: 01/09/2001

End: 29/02/2004

<http://oasis.cnice.mecd.es/>

Description

The development of computer-based, and in particular Web-based, technologies and systems for use in education, should be especially suitable for small schools, which do not necessarily have the resources required to implement new technologies on their own. By getting together to form virtual communities, these schools can avoid missing out on the revolution in computer-based education, sharing information and applications to improve education services in a cost-effective way. The OASIS project is developing the concept of a small school community using a “school portal” as the main tool. The development of such a system poses several challenges, not least how to achieve interoperability to ensure that users equipped with different applications and services can share information. This is essential if usability, accessibility, efficiency and cost-effectiveness are to be achieved.

Technology/Prototype

Prototypes of three key OASIS components will be developed - a Zone Server, a School Server and a Java-based Kernel. These will be designed in accordance with the specifications for interoperability defined previously.

Reusable output

An important element of the OASIS project will be the setting up of a software library of open code supported by harvesting and metadata cataloguing tools. The library will be designed for use by both software professionals and teacher authors, and will include distribution and training systems.

6.2.15 PROMENTHEA – PROMETHEUS (IST-2000-26204)

Abstract

PROMENTHEA – PROMETHEUS

Pathways into knowledge / Research on Options in Media / Evolving of knowledge / Technology / Hypermedia / Environment

IST-2000-26204

Start May-2001

End Oct-2003

<http://www.promenthea.net/> (not responding)

<http://pi.ijs.si/ProjectIntelligence.Exe?Cm=Project&Project=PROMETHEUS>

Note: The project PROMENTHEA seems to have been renamed PROMETHEUS.

Description

The objective of the project was to create individual and collaborative learning support environments.

Technology/Prototype

Web-based collaborative learning environment, called COLLEEN.

No information is presently available.

Reusable output

No information is presently available.

6.2.16 RELOAD

Abstract

Reusable Learning Object Authoring and Delivery

<http://www.reload.ac.uk/>

The project focuses on the development of tools that are based on emerging learning technology interoperability specifications. It is being managed by Bolton Institute.

Description

The primary aims of this project are to:

- Facilitate the creation, sharing and reuse of learning objects and services
- Enhance the range of pedagogical approaches realisable through the use of lesson plans

These aims will be achieved through the production of a suite of software tools for authoring and delivery of standard-compliant learning objects incorporating comprehensive user guides and exemplar resources. The tools will be of significant value to the JISC (UK) and wider community, since they provide the crucial "missing link" which allows users to author and transfer learning objects, in specification compliant format, between authoring and design tools, local and distributed digital repositories, and VLEs.

Technologies used

Java

Additional Information / Comments

RELOAD is built directly on tools and systems delivered by several earlier JISC projects: including PackageIt! and the Colloquia VLE.

Reusable output

An ADL SCORM Player is being developed at Bolton Institute and is now available.

6.2.17 SCHOOL+ (IST-2000-25162)

Abstract

SCHOOL+

More than a Platform to Build the School of Tomorrow

IST-2000-25162

Start: 01/09/2001

End: 31/08/2004

<http://www.school-plus.org/>

Description

The School+ project aims to develop a comprehensive teaching and learning environment using state-of-the-art technologies to integrate a progressive educational approach with ICT for promotion of high-level cognitive emotional and social activities, promotion of autonomy and creativity and enhanced communication.

Technology/Prototype

A comprehensive learning environment system based on state-of-the-art technologies (such as VR, 3D, CSCW, WWW, WAP and MPEG4) will be designed, built, implemented and tested.

Reusable output

By the end of the project, SCHOOL+ will have developed a comprehensive, online teaching and learning environment, called SCHOOL+ Mircocosmos, which will be tested in about 20 European schools.

(No useable output at present.)

6.2.18 TRAIN.ME (IST-1999-21036)

Abstract

TRAIN.ME

Personalised learning on-demand and on-the-job

IST-1999-21036

Start: 01/03/2001

End: 28/02/2002

<http://www.train-me.org/> (empty)

Description

Objectives:

Trial, evaluate and document the impact of implementing a personalised learning system in an association of SMEs.

The “Train.Me” project aims to boost the competitiveness of Small and Medium Enterprises through the trial, evaluation and documentation of the impact of implementing a personalised learning system in an association of SMEs. The system will integrate two different existing developments that currently meet the requirements of two different users, content providers and education companies, but which share the use of Web-based technology:

- An offline content creation and authoring tool, consisting of re-usable software components. This tool is the product of the Multimedia Broker Telematics project (IE2093) and
- An online learning environment, with personalisation, permitting online, on demand auto learning.

Technology/Prototype

The system integrates two different existing developments that meet the requirements of two different users, content providers and education companies, which share the use of Web-based technology:

- An offline content creation and authoring tool, consisting of re-usable software components. This tool is the product of the Multimedia Broker Telematics project (IE2093).
- An online learning environment, with personalisation permitting online, on demand auto learning.

Reusable output

No information is provided about any components/tools that are either useful or can be reused.

6.2.19 VIDL

Abstract

VIDL

Virtual Intelligent Distance Learning

IST-2000-29390

Start: 01/11/2001

End: 30/11/2002

<http://www.trainvision.com/>

Description

Evaluation of a low cost, high quality, and completely innovative, artificial intelligence based approach to on-the-job e-Training that adjusts to the level and the progress of the trainee. This solution includes an artificial intelligent model that simulates the behaviour of a human trainer and thus adapts to each trainee and adjusts according to the level and progress of the trainees.

Technology/Prototype

The approach is implemented in Train Vision's technology-based product.

<http://www.trainvision.com/>

Useful output

Listed below are Train Vision's products and the several options offered.

- EduTrain (Beta): authoring tool, LMS, on-line and off line content and a report generator.
- EduTrain Pro (Alpha): EduTrain (see above) plus: AI based Advance Adaptive Modelling (learning by examples, smart navigation, auxiliary material/time and

action, case base reasoning, interactive conversation model, task space management, visual level adaptation, corrective study strategy), individual's (course level and down) knowledge map, infrastructure for cognitive and behavioural concept mapping.

- Add on options – each of the following options can be added to each of the products:
 - Collaboration tools (communities, virtual class, chat, message board, email, library)
 - Simulation tool
 - Off-Line publishing of a course
 - Jobs, Skills-Competences, Knowledge Items – Mapping, relations to courses and applying for individual learners.

6.3 Projects mainly focussed on Management of Content

Note: A limited number of projects focussing on content management aspects (how existing learning object are exchanged and reused) are described for information, since they do not correspond to the scope of this document.

6.3.1 CELEBRATE (IST-2001-35188)

Abstract

CELEBRATE

Context e-Learning with broadband technologies.

IST-2001-35188

Start: 01/06/2002

End: 30/11/2004

<http://inf2.pira.co.uk/factsheets/inform/et/celebrate.html> (not responding)

<http://www.eun.org/celebrate/workplan.html>

Description

Objectives:

To develop a teaching methodology for collaborative e-Learning, involving the creation of a 'critical mass' of electronic Learning Objects to be made available through a pilot demonstration portal to schools in six European countries. To act as a catalyst for the European e-Learning content industry and increase the focus on issues related to standards compliance and interoperability.

The CELEBRATE project will develop a wide range of electronic learning objects, capable of being used and re-used in a range of formats in a new generation of managed learning environments.

Target Users: School

Technology/Prototype

No information available.

Useful output

No information available.

6.3.2 CUBER (IST-1999-10737)

Abstract

CUBER

Personalised Curriculum Builder in the Federated Virtual University of the Europe of Regions

IST-1999-10737

Start: 01/03/2000

End: 31/08/2002

<http://www.cuber.net/>

Description

The aim of the project CUBER is to build an adaptive high-precision information system for information technology (IT) courses of European universities. The main focus of the project is to establish the groundwork for a Federated European Virtual University through a broker service (the CUBER system) that provides access to the vast array of courses offered by European higher education providers and, in particular, distance teaching universities.

Focus: Searching content.

Technology/Prototype

No information about the technologies used in the project is available.

<http://www.cuber.net/cuber.html> (The link is presently not responding.)

Useful output

The prototype of the authoring interface is presently not accessible.

<http://www.cuber.net/Test-Prototyp/ai/login.jsp>

6.3.3 FAIR Enough (UK-JISC)

Abstract

The FAIR Enough Project

Focus on Access to Institutional Resources (FAIR) Programme

<http://www.fairenough.ac.uk/>

Description

The Fair Enough project will conduct a series of experiments with the embedding of JISC collections and services into a variety of VLE and intranet delivery systems (portals) within the colleges within consortia. These experiments will also see how well these JISC collections and services can be presented in tandem with assets and services held by the colleges.

Support: The FAIR Enough project is partly funded by JISC (Joint Information Systems Committee), UK.

Technology/Prototype

No information is presently available.

Useful output

No information is presently available.

6.3.4 uPortal

Abstract

uPortal

<http://www.ja-sig.org/>

Description

uPortal is a free, sharable portal under development by institutions of higher education. This group sees an institutional portal as an abridged and customized version of the institutional Web presence... a "pocket-sized" version of the campus Web. Portal technology adds "customization" and "community" to the campus Web presence. Customization allows each user to define a unique and personal view of the campus Web. Community tools, such as chat, forums, survey, and so on, build relationships among campus constituencies.

Technology/Prototype

uPortal is an open-standard effort using Java, XML, JSP and J2EE. It is a collaborative development project with the effort shared among several of the JA-SIG member institutions.

License: Redistribution and use in source and binary forms, with or without modification, are permitted provided that the some conditions.

Useful output

Users interested in quickly setting up and demonstrating an uPortal site may download the quick-start distribution of uPortal. This distribution provides a "drop it in and go" configuration of uPortal. The intent is to make it easier for potential content developers to quickly get uPortal up and running and allow them to begin building content. The builds include a working configuration of the Tomcat Servlet Engine and Hypersonic SQL database.

For more details on how to configure and setup uPortal please read:

<http://www.fair-portal.hull.ac.uk/downloads/uPortalGuide1.pdf>

6.3.5 EduSource (Canada)

Abstract

EduSource

<http://www.edusource.ca/>

Description

The EduSource project is a pan-Canadian collaborative project to create a test-bed of linked and interoperable learning object repositories. The general vision of the EduSource project is focused on the creation of a network of linked and interoperable learning object repositories across Canada. The initial part of this project will be an

inventory of ongoing development of the tools, systems, protocols and practices. Consequent to this initial exercise the project will look at defining the components of interoperable framework, the web services that will tie them all together and the protocols necessary to allow other institutions to enter into that framework.

Technology/Prototype

The functional specifications of the project are accessible only by the project members and no information is provided to the visitors of the site.

Useful output

At the end of the project the team will have developed an integrated suite of software tools for the implementation and management of learning object repositories. These software tools will form the foundation of the pan-Canadian repository network and their development will be coordinated across various institutions by Cogigraph.

6.3.6 Open Archives Initiative (US-NSF)

Abstract

Open Archives Initiative

<http://www.openarchives.org/>

Description

The Open Archives Initiative develops and promotes interoperability standards that aim to facilitate the efficient dissemination of content. The OAI Technical Committee evaluates the effectiveness of the OAI interoperability architecture and proposes changes and enhancements based on community experience.

Useful output

A list of all general software tools that may be useful for implementing OAI-conformant data and service providers can be accessed from the link below:

<http://www.openarchives.org/tools/tools.html>

6.3.7 MITOpenCourseware (US)

Abstract

MITOpenCourseware

<http://ocw.mit.edu/OcwWeb/>

Description

MIT OpenCourseWare aims at advancing education by increasing access to their academic materials through the Internet and the World Wide Web. Course material is openly shared thus creating a repository of knowledge.

MIT Open Course Ware is a large-scale, Web-based electronic publishing initiative funded jointly by the William and Flora Hewlett Foundation, the Andrew W. Mellon Foundation, and MIT. Its goals are to:

- Provide free, searchable, coherent access to MIT's course materials for educators in the non-profit sector, students, and individual learners around the world.

- Create an efficient, standards-based model that other universities may emulate to publish their own course materials.

MIT is one of the original partners for OKI and is devoted to open standards.

Technology/Prototype

The temporary approach is based on:

- HTML.
- Standalone course sites.
- Manual coding.

Implementation of longer-term scalable infrastructure:

- XML.
- Content management tools.
- Integration with related MIT learning management systems.
- OKI compliance.
- Full-featured content management and publication production system.

Useful output

Some of the benefits of the MIT open course initiative for outsiders would be:

- Viable resource for adoption of courses/ curricula by others.
- Model for sharing courseware at other institutions.

6.4 Projects mainly addressing the Authoring Dimension

Note: A limited number of projects that focussed on authoring aspects are described for information, since they do not correspond to the scope of this document.

6.4.1 CANDLE (IST-1999-11276)

Abstract

CANDLE

Collaborative And Network Distributed Learning Environment

IST-1999-11276

Start: 01/06/2003

End: 31/05/2003

<http://www.candle.eu.org/>

Description

The objective of this project is to use the Internet to improve the quality and reduce the cost of ICT teaching in Europe by using web and multimedia technology, and to enable cooperation between universities and industry in creating and reusing learning material and improving the quality of delivery. The proposed system is not designed to constrain the freedom of academics and trainers to develop their own courseware. This flexibility is ensured through the use of component architectures, toolkits and pedagogical frameworks that allow individual teacher to combine course objects to create their own courses designed to meet their learners particular needs. The results of the project will also be made available under the "open courseware" license.

Technology/Prototype

The Candle system has been designed using Java, Servlets and xml.

Useful output

No reusable components are available to non-members. No clear information available about tools that can be reused by others.

6.4.2 DIOGENE (IST-2001-33358)

Abstract

DIOGENE

A Training Web Broker for ICT Professionals.

IST-2001-33358.

Start: April 2002.

End: April 2004.

<http://www.diogene.org/>

Description

Objective: The main objective of DIOGENE is to design, implement and evaluate a training Web brokering environment geared towards ICT professionals and be able to cover the whole lifecycle of ICT vocational training inside and outside enterprise boundaries. DIOGENE aims to design and implement a self-learning Web environment able to support the individual from the definition of objectives to the assessment of the results through the construction of custom self-adaptive courses. The system will be accessible through the Web and will take the form of a training portal. It will use state of the art technology (metadata and ontologies for knowledge manipulation, fuzzy learner modelling, intelligent information retrieval, distributed Web services).

Technology/Prototype

No information is available about the technologies used.

Useful output

No tools/useful output available at present.

6.4.3 Easel (IST-1999-10051)

Abstract

Easel

Educator Access to Services in the Electronic Landscape

IST-1999-10051

Start: February 2000

End: February 2002 (extension to 30/04/2002)

<http://www.fdggroup.com/easel/>

Description

Objective: The purpose of the EASEL project is to explore standards and technologies that can be brought together to allow educators to create courses re-using content developed by others.

It has explored technologies, which can be brought together to offer course constructors an environment in which they can combine existing learning objects to create new online educational offerings.

Technology/Prototype

Easel is developing a prototype service in which resource discovery is achieved through a repository of high quality resource descriptions or 'metadata'. A single search will find items described using different metadata schemas and different versions of one schema. The system is designed to allow collections of material using different schemas to be added easily.

Useful output

EASEL will develop a Course Constructor Kit through which course creators will be able to easily combine learning objects once found.

6.4.4 TRIAL-SOLUTION

Abstract

TRIAL-SOLUTION

Tools for Reusable, Integrated, Adaptable Learning - Systems/Standards for Open Learning Using Tested, Interoperable Objects and Networking
IST 11397

Start: February 2000

End: January 2003

<http://www.trial-solution.de/>

Description

Objective: To use open platforms and tools to develop and then validate a powerful new way of creating, delivering and managing personalised education and training.

Note: This project seems however focussed mainly on authoring (slicing content).

Technology/Prototype

The background to this project is a software tool from the company Slicing Book Technology that enables authors, teachers and students to produce personalised teaching or learning materials.

The system is composed of five modules

- Splitter
- Meta-data Tool
- Meta-data Server
- Authoring Tool
- Delivery Tool

Useful output

The tools developed during this project are still not made public and are used only internally.

6.5 Miscellaneous Projects

6.5.1 KITS (IST-1999-13078)

Abstract

KITS

Knowledge management Interactive Training System

IST-1999-13078

Start: May 2000

End: November 2002

<http://www.kmquest.com/>

Category: Game

Description

The learning game:

The KITS project develops and evaluates a learning environment that is an educationally supported distributed game in the domain of knowledge management (KM). In order to achieve its objective, the project will develop and implement a model for game-based training that includes instructional interventions, mechanisms for remote playing with the game, a knowledge management model, and a knowledge management relevant business model. In the game (called KM-Quest) three players together play the role of knowledge manager in a fictitious company called “Coltec”. Coltec produces adhesives and is an example of a “product leadership” company. Players have to react to events that happen to the company and they do so by selecting knowledge management related interventions. They observe the results of their interventions by looking at the development of values of business and knowledge management related variables. KM-Quest is built in such a way that the specific case (Coltec) can easily be adapted.

Technology/Prototype

No information provided.

Useful output

No useful/reusable output is known of from this project.

6.5.2 ICIS (IST-2000-29323)

Abstract

ICIS

Integrated E-training and Recruiting Community for IT Professionals and IT SMEs

IST-2000-29323

Start: January 2002

End: June 2003

Category: Assessment

Description

This prototype system provides support to the baseline process by allowing easy use of an integrated solution including tools such as RDA assessment, ITPro skills profile, career path development, and online training and recruitment.

<http://www.eidosis.com/icis/progetto/>

Note: The e-learning platform is EdCenter from Training Associates.
(<http://www.edcenter.com/>)

Technology/Prototype

No information available.

Useful output

No information is available.

7 ANNEX 2: General Technologies, Frameworks

7.1 Middleware & frameworks

7.1.1 Java J2EE

Description of the technology

The Java 2 Platform, Enterprise Edition (J2EE) defines the standard for developing multi-tier enterprise applications. The J2EE 1.4 platform introduces new APIs, which implement core Web services protocols stack. It also introduces new Management and Deployment APIs, new versions of the Java Server Pages, Enterprise JavaBeans, and Connector APIs, along with other features which establish J2EE 1.4 technology as a premier Web services and enterprise application integration platform.

References/Links:

The link below provides all the information about J2EE technology. The official website of Sun, also has useful information for developers, downloads sections, official documentation, etc.

<http://java.sun.com/j2ee/>

7.1.2 Microsoft .NET

Description of the technology

Microsoft® .NET is a set of Microsoft software technologies for connecting information, people, systems and devices. It enables a high level of software integration through the use of Web services — small, discrete, building-block applications that connect to each other as well as to other, larger applications over the Internet.

References/Links

The official website of Microsoft has all the information about the .NET technology, resources for developers, samples of code, downloads, etc.

<http://www.microsoft.com/net/>

7.1.3 IBM Lotus Domino

Description of the technology

Lotus Domino provides a multiplatform foundation for collaboration and e-business, driving solutions from corporate messaging to Web based transactions - and everything in between. This enterprise-class messaging and collaboration system is built to maximize human productivity by unleashing the experience and expertise of individuals, teams, and extended communities.

References/Links

The link to the official website of IBM Lotus Software is given below. The website explains in detail all the features of Lotus Domino and has lots of useful information for developers. Developers can also make use of the Lotus Developer forum, which is very useful while working with Lotus products.

<http://www.lotus.com/products/product4.nsf/wdocs/dominohomepage>

7.1.4 Portlets

Description

Portlets are little portal windows that connect to specific back-end functions. A portlet API standard is emerging. Java Specifications Requests (JSRs) are the actual descriptions of proposed and final specifications for the Java platform. JSR 168 - Portlet Specification - will define a Portlet API that provides means for aggregating several content sources and applications front ends.

References

<http://jcp.org/en/jsr/detail?id=168>

7.1.5 The Eclipse integration mechanisms (plug-ins)

Description

Eclipse is an extensible platform for building IDEs. It provides a core of services for controlling a set of tools working together to support programming tasks. Tool builders contribute to the Eclipse platform by wrapping their tools in pluggable components, called Eclipse plug-ins, which conform to Eclipse's plug-in contract. The basic mechanism of extensibility in Eclipse is that new plug-ins can add new processing elements to existing plug-ins.

References

<http://www.eclipse.org/>

Azad Bolour (2003), 'Notes on the Eclipse Plug-in Architecture', July 3, 2003

http://www.eclipse.org/articles/Article-Plug-in-architecture/plugin_architecture.html

7.1.6 The WEB services

Description

The World Wide Web is more and more used for application-to-application communication. The programmatic interfaces made available are referred to as Web services. The goal of the Web Services Activity is to develop a set of technologies in order to lead Web services to their full potential.

References

<http://www.w3.org/2002/ws/>

7.2 Communication frameworks

7.2.1 Lotus Sametime

Description of the technology

Lotus Sametime is real-time collaboration software, with online awareness, instant messaging, application sharing and virtual meetings. Lotus Sametime helps your

organization be more responsive and more efficient by allowing your employees, customers, partners, and suppliers to easily interact with one another in real-time.

References/Links

More information about IBM Lotus Sametime and its features can be found at:
<http://www-1.ibm.com/servers/eserver/series/sametime/>

7.2.2 Macromedia Flash Communication Server MX

Description of the technology

Macromedia Flash Communication Server MX is a server-based platform for creating and deploying compelling, interactive web-based audio/video applications such as video on demand, live event broadcasts, webcam chat, and real-time collaboration applications.

References/Links

For more information about Macromedia Flash Communication Server MX, please visit the official website of Macromedia:
<http://www.macromedia.com/software/flashcom/>

7.2.3 Sun JXTA

Description of the technology

Introduced by Sun Microsystems, Inc., Project JXTA, the award winning technology, is a set of open, generalized peer-to-peer protocols that allows any connected device (cell phone to PDA, PC to server) on the network to communicate and collaborate. Project JXTA is an open source effort that involved the developer community from the start.

References/Links

Some useful links related to Project JXTA are provided below:
<http://www.jxta.org/> (Peer to Peer)
<http://www.java.net/> (Java collaboration technologies.)

7.2.4 Others

Other technologies can be mentioned such as the open source systems JGroup, a Toolkit for Reliable Multicast Communication (<http://www.javagroups.com/>), or the open source system Jabber (<http://www.jabber.org/>), an open XML protocol for the real-time exchange of messages and presence between any two points on the Internet that can be used to implement IM (Instant Messaging) systems as it is done with the Apache open-source Java implementation.

8 Annex 3: Knowledge Sharing Systems, Virtual Environments

8.1 Overview of the market

There are not many systems explicitly oriented to knowledge sharing between virtual networks of people. Nevertheless, there are a number of products that have enough relevant features to be useful. A number of companies are moving towards this direction, more notably Microsoft with Team Services (a product aiming to support information and knowledge sharing between teams of collaborators), by expanding on their basic facilities. Still, the market is in an early phase, with many products focusing on one or more aspects of the whole picture.

8.1.1 Knowledge repositories and knowledge portals

8.1.1.1 Microsoft SharePoint Portal Server

SharePoint is Microsoft's knowledge portal interface that is aimed at knowledge workers. The SharePoint is a cross between Microsoft's active Desktop, an executive information system, an e-mail client and a web browser. It provides a single consolidated interface for accessing and managing corporate, team and personal information that is stored in Exchange, SQL Server or web servers and other legacy file systems. SharePoint is built around Microsoft's Office 2000 suite. It is specifically hosted in the 'Outlook Today' page of Outlook 2000, which is part of Office 2000. Creating a Digital Dashboard, the interface, involves customising the Outlook Today page. Users can also access the analysis tools and web-based collaboration features built into Office 2000.

Microsoft SharePoint presents a set of two new technologies from Microsoft that were developed to facilitate information sharing both within organizations and over the Internet, SharePoint Portal Server 2001 and SharePoint Team Services. Microsoft's research demonstrated that no one solution could address the information-sharing needs of an entire organization; small and ad hoc teams share information in very different ways than do large teams.

Small or ad hoc workgroups need informal means to work together on group deliverables, share documents, and communicate status with one another. These groups need to share information easily and effortlessly and SharePoint Team Services-based Web sites allow them to do that.

Large workgroups with structured processes need greater management over their information. They require features like formal publishing processes and the ability to search for and aggregate content from multiple data stores and file formats. For this scenario, SharePoint Portal Server 2001 is recommended.

8.1.1.1.1 SharePoint Team Services

The SharePoint Team Services technology gives users the ability to quickly create and contribute to team or project-focused Web sites from within their browser or Office XP applications. With SharePoint Team Services, teams can create a Web site for sharing information such as documents, calendars, announcements, and other postings. Web sites created with SharePoint Team Services are easy to customize and manage. SharePoint Team Services will initially be included with FrontPage version 2002 Web site creation and management tool, and those versions of Office XP that

contain FrontPage. Microsoft plans to include the technology in upcoming releases of the Windows Server operating system and other Microsoft products.

8.1.1.1.2 Microsoft SharePoint Portal Server 2001

SharePoint Portal Server 2001 creates a portal Web site that allows users to share documents and search for information across the organization and enterprise, including SharePoint Team Services-based Web sites—all within one extensible portal interface. SharePoint Portal Server includes document management features that allow companies to incorporate business processes into their portal solution. SharePoint Portal Server 2001 is a stand-alone server product.

8.1.1.2 Plumtree Corporate Portal Server

Plumtree's flagship product is the Plumtree Corporate Portal Server for creating and maintaining a corporate portal - a web portal (like Excite or Yahoo!). The Plumtree Corporate Portal Server is the backbone of Plumtree's system. The server polls data sources for new information, organizing data from disparate sources in a single administrator-defined hierarchical catalogue, and publishes personalized views of information on the web or via e-mail.

The portal combines the information management capabilities of a storage system (which replicates all content), the search capabilities of a text-search engine (which requires a user to issue a search before retrieving and displaying content) and the publishing capabilities of a web application server (for publishing content to the system).

The Plumtree Portal also creates a web directory for information stored in documents, web pages, groupware databases, and a wide array of database applications, such as online analytical processing, customer relationship management and enterprise resource planning systems. End users can access information from a variety of systems in a single catalogue.

8.1.1.3 Intraspect

At the heart of any Intraspect *knowledge management* system is the Knowledge Server, which provides collaboration and KM services for both client-server and web environments.

The Knowledge Server consists of a Windows NT-based repository and a full text search engine (licensed from Verity). The core of the product is written in Java and the repository is implemented in an object-oriented database (licensed from Objectivity). Both the object database and search engine are completely embedded and require no separate administration.

The Knowledge Server addresses six distinct information-processing functions that enable collaborative knowledge management: information organisation, information collection, information sharing, collaboration, discovery and search, and subscription.

8.1.1.3.1 Information organization

The structure of the Knowledge Server repository is based on sets of hierarchical folders. An item such as a Word document is added by dragging and dropping it from its location on the network into a 'collection bin' – a window used to import files or web pages into Knowledge Server. From the collection window, which acts as a form

of temporary storage, items are assigned to the relevant locations within the folder hierarchy.

Intraspect can import from any information source that presents its data over HTTP or SMTP. Relational database, groupware and document management systems can be accessed as long as there is a gateway providing browser access to the data.

8.1.1.3.2 Information collection

An innovative component of the Intraspect system is the freedom available to users for contribution to the group memory. Intraspect is designed for enterprise-wide participation, making it easy for any user to contribute information. Users can drag and drop items into the group memory from:

- Client-server Windows applications
- A web browser, by dragging in a URL from a web browser
- E-mail. Since each folder has an e-mail address, items can be sent directly to a particular folder (as an attached document) or to a collection bin for later categorisation.

8.1.1.3.3 Information sharing

Intraspect provides online workspaces for collecting and organizing information, with versioning and access control. Personal and public spaces are integrated into enterprise object repository to support individual usage and simplify wide-area collaboration. Integrated commenting allows collaborative review of content, or for taking personal notes.

8.1.1.3.4 Collaboration

Intraspect allows users to create, and participate in, discussions within the group memory. As well as e-mails, web pages and desktop files, a folder (or workspace) can contain comments and threaded discussions. Users can add comments or contribute to a discussion group via the Intraspect client interface, a web browser or through e-mail. Messages are automatically threaded and parsed for attachments and can be distributed by e-mail to interested participants. Discussion items are saved in the system in context.

Users can create distribution lists for documents and discussions by selecting a user's e-mail address. The discussion can also include people outside the organisation – useful for extranet applications for capturing information customers or suppliers. Since each folder has its own unique e-mail address, external users with access rights can send messages directly into Intraspect.

8.1.1.3.5 Discovery and search

Intraspect uses the Verity engine to index all information added to the group memory for both content and metadata, and to allow users to search for information in a variety of ways. There is a full-text search capability across all items in the repository – including word stemming (such as the recognition of plurals and tenses) and attribute searches. The folder structure also provides an important search function, enabling users to move from retrieved documents, to view associated files and comments in the same folders.

Intraspect has embedded Autonomy's 'spider' technology to extend search capabilities to Lotus Notes databases. Access to Autonomy's core Dynamic Reasoning Engine (DRE) is also provided for building more sophisticated search capabilities.

8.1.1.3.6 Subscription

The system is flexible in allowing users to subscribe to only the portions of the group memory that is relevant to their work. For example, in a typical portal application, users subscribe to enterprise reports and to the business decisions based on those reports. The portal is therefore the logical starting point for additional research or the commencement of a collaborative business process.

Users can subscribe to any object (including workspaces, discussions and specific searches) and be notified if that object is changed, deleted or added to. User-defined 'Knowledge Agents' are used to subscribe to object types and receive updates via integrated push technology. Notification of changes to subscribed objects can be delivered asynchronously to end users via e-mail, a personal web page or other push channels.

8.1.1.4 Lotus products for knowledge sharing

Based on the vast experience of IBM and Lotus regarding knowledge management applications and tools, IBM and Lotus have decided that knowledge sharing software should provide virtual "places" where users can organize information, services, and tools to support their particular needs, while at the same time maintaining and updating information in a more general context. The two main components that have been developed to support this idea are Lotus K-station portal and Lotus Discovery Server.

8.1.1.4.1 The K-station portal

The K-station portal organizes all of a user's information, applications, and contacts by community, interest, task, or job. Users create a personal place by selecting from a list of pre-configured "portlets" (e.g., mail, calendar, discussions, to-do items, team rooms, custom applications, and Web sites). Portlets can support any Domino or non-Domino applications. Each user's place provides access to a list of other public places that users can join.

The K-station portal includes multiple places that can be defined by users, created by departmental or enterprise IT (information technology) departments, or developed and shared by colleagues. Community places (e.g., a "personnel review place" or a "new product brainstorming place") are activity-based. In these places, users monitor project status and participate in decision-making. For example, a sales place might include a sales-results reporting application, an information retrieval application, a list of sales tools, and a list of marketing staff available for consultation.

8.1.1.4.2 The Discovery Server

The Discovery Server comprises a content catalogue and a set of services that collect, collate, and maintain information in the catalogue. The catalogue is an index to the written information and expertise that exist within an organization. The server regularly refreshes the catalogue by tracking content, user interests, and usage activity. It delivers information about an organization in terms of where things are, who knows what, what is important, and what subjects generate the most interest and activity. Primarily, it gathers existing corporate documents (in Notes databases, external Web sites, and files on the intranet), creates several representations of this information in XML (extensible mark-up language) in a full-text index, in document clusters, and in a user profile database), and provides several user interfaces to display and maintain the information in various ways. The information is stored in a DB2

database, which is accessed by the various services whenever they need to display or maintain the data.

8.1.1.4.3 Spiders

The Discovery Server spiders are the “worker” tasks of the system. They run on a schedule set by the administrator. They either gather documents from the selected sources or monitor changes and deletions to the sources. Each supported data type (Notes databases, file system files, external Web sites) has its own customized spider. Discovery Server administrators complete on-line forms that describe each source to be included in the catalogue. They provide information about where to find the source, and in the case of Web sites and file system files, about how many levels to retrieve based on links or subdirectories within the source.

Specialized versions of the Discovery Server spiders, called profile source spiders, gather information about individuals from Domino directory databases and LDAP (Lightweight Directory Access Protocol) server-compliant directories. Another spider examines Domino e-mail content but does not participate fully in the Discovery Server processes. E-mail content provides relationships between individuals and subject matter (affinities), but this content can never be published through the other Discovery Server services.

When scheduled, the e-mail spider connects to the specified Domino mail database and examines all sent and saved mail. The author, from, to, copy to, subject, and body fields are extracted and converted to XML using the process just described. The Discovery Server K-map indexing and K-map builder services do not directly process the e-mail content. Instead, the e-mail XML is forwarded to the metrics queue. The metrics process evaluates e-mail content to determine relationships to existing K-map category areas. E-mail content with no relationship to K-map category areas is ignored.

8.1.1.4.4 The K-map

The K-map is the backbone of the Discovery Server's search-and-browse user interface. It is accessed by users to locate content from many disparate sources, by “drilling down” through subject clusters, by using a full-text search, or by using a combination of both search strategies. Additional information about the relationships between individuals and document activity adds value and context to the user's search and retrieval experience. The K-map supports dynamic access to document security information when content is searched, to ensure that users view only the documents they are authorized to access. The K-map user interface shows people awareness, affinities, and document values.

8.1.1.5 LiveLink-Open Text

Livelink comprises a suite of core modules (as well as several optional service modules) that are tightly integrated to support the four principal functions that make up a collaborative knowledge management system:

- Enterprise knowledge library
- Information retrieval
- Business process automation
- Project team collaboration.

8.1.1.5.1 Enterprise knowledge library

The Livelink Library is a central repository for storing documents and other file types in a hierarchical structure. The library works across multiple locations, allowing users to store, browse, search and access (or 'check out') documents and other work objects. It includes a set of features and functions for accessing, controlling and managing documents on an intranet, while also controlling security. Users are provided with three main views (workspaces) of folders and documents – 'enterprise', 'personal' and 'project'. They see only the entries for items for which they have minimum read-access privileges. The library also provides a history and audit trail of document versions, including a record of why changes were made. Livelink provides an integrated directory services component that supports synchronisation using LDAP and Windows NT Domain directories, and unified logon capabilities.

8.1.1.5.2 Information retrieval

Livelink Library is tightly integrated with Livelink Search, an extensible text-retrieval engine that allows Livelink users searching access to Livelink repositories (while adhering to Livelink permissions), corporate web sites, file servers and the Internet. The search capabilities include Boolean, proximity, thesaurus, soundex, stemming, data range, advanced similarity and full-phrase searching. Livelink Search also allows users to assign relative weights to search terms and provides intelligent relevance rankings. The tool supports most document format standards, including HTML, SGML and PDF. With the Livelink Spider option, the system can crawl designated websites to keep searchable indexes current and unified and 'push' updates to users. The following modules provide extended information retrieval services:

- Livelink Channels, which enable users to publish relevant news on activities, projects and events to project members or the enterprise
- Livelink Change Agents, agent software that monitors activities and objects (documents, workflows and project tasks) managed by Livelink repositories, and notifies users of important changes via e-mail, voicemail, pagers, faxes or mobile cell phones
- Livelink LiveReports, a management tool for reporting on Livelink activities using SQL queries.

Unlike many other document management vendors, Livelink's information retrieval technology is non-OEM and works across all Livelink modules, not just documents.

8.1.1.5.3 Business process automation

Livelink Workflow provides a set of workflow management tools that are tightly integrated with the core Livelink document repository. Using sets of document templates (created with HTML page displays and links to related items), users can create and manage individual business workflows – capturing serial, parallel, rendezvous and conditional looping processes. The workflow activities include conditional branching with true/false statements, as well as multiple start and end points. Triggering events for individual activities can be based on field values, as well as explicit choices. Livelink Workflow also exploits the network connections to the central document store. These individual workflows depend upon Livelink Library, with its relational database capabilities, for storing the metadata about individual documents.

Livelink Workflow is based on a visual, interactive mapping metaphor and is implemented in Java. It provides a visual workflow design tool, called Livelink

Workflow Painter, for mapping business processes using a simple drag-and-drop interface.

Livelink Forms is another Java-based module that tightly integrates with Livelink Workflow to intelligently collect and act on user input and route forms-based data through workflows.

8.1.1.5.4 Project team collaboration

A key feature of Livelink is its support for project teams. Livelink Project Collaboration provides a 'virtual' environment within an intranet for co-ordinating aspects of a group project, such as the documents being created, project members, workflow assignments, project task lists and informal group discussions.

To improve knowledge sharing within a project, project-based libraries, bulletin boards and conferencing facilities are provided. *Ad hoc* information exchange is supported through project discussion databases and linked tightly to Livelink's underlying document management facilities. Individual members can post ideas on the shared server by entering text documents or adding attachments to generate informal conversations; other members can then read and post replies.

8.1.1.6 Autonomy

Autonomy's knowledge management solutions consist of a number of products that are collectively marketed as Knowledge Management Suite. The main offering consists of two products: *Knowledge Server and Knowledge Update*.

Both products are built around Autonomy's Dynamic Reasoning Engine (DRE). The DRE utilises 'Concept Agents', the pattern recognition technology at the heart of all Autonomy products. The agents give Autonomy's knowledge management products their ability to construct user profiles based on the user's dynamic interaction with the content. These profiles not only improve the effectiveness of the information delivery, but also improve the way knowledge is shared in an organisation. Communities of interest can be built, bottom-up. The automation of this process means that there is no administrative overhead to increase actual costs and reduce the flexibility of the system. The DRE has a statistical understanding of the patterns of 'typical' English, but can be trained on the patterns of all the major European languages. Versions for other languages, such as Japanese, Arabic, Thai, Korean, etc., are also available.

8.1.1.6.1 Knowledge Server

Knowledge Server is the core engine of Autonomy's knowledge management solution. It automates the categorisation, cross-referencing and hyper linking of documents from a diverse range of information sources. It provides access to around 250 different data sources, including the Internet and intranets, Lotus Notes, Microsoft Exchange, PDF files, word processing documents and SQL/ODBC databases. Knowledge Server runs on Windows NT, Unix Sun and Digital Alpha.

8.1.1.6.2 Knowledge Update

Knowledge Update monitors Internet and intranet sites and news feeds to provide personalised information delivery. It can also be used to monitor internal sources such as Notes databases and word processing files. Like Knowledge Server, Knowledge Update works with pattern-based user profiles. As it collects new items, it ranks them according to relevance. The user tailors a profile automatically by identifying the items that are most relevant to their needs.

8.1.1.7 Verity

Verity's current knowledge management offerings bring together a group of separate products that had addressed different search and retrieval problems (web access, Microsoft Exchange, agent services, portal development and maintenance). They are referred to collectively as the Verity Knowledge Retrieval Product Suite. For client-side interaction, Verity relies on standard web browsers. Users can acquire browser plug-ins for WYSIWYG viewing of source documents in their original format, using KeyView Pro, a desktop viewing product acquired by Verity in 1997.

8.1.1.7.1 Information Server

Information Server is the search engine at the heart of Verity's knowledge retrieval products. Information Server builds its indexes to information sources on a corporate intranet and selected Internet sites. Information Server maintains a full-text index, custom metadata and the physical file system or URL address of the document. Verity tools track document changes, additions and deletions automatically. Verity Information Server runs on Unix and Windows NT platforms. A companion product, the Verity Spider, indexes file systems, and Internet and intranet websites, extracting full text and metadata while building the core Verity collection. Agent services are provided through an additional component Agent Server Verity provides a range of search options, including its 'accrue' operation, described as an intelligent 'or'. This was the function at the heart of Verity's initial product for the US security services: it enables a sophisticated analysis of documents with reference to grouped key words in terms of both number of occurrences and also their proximity. A key element of Information Server is the ability to build rules into the indexing operations, for example, to limit indexing to documents with certain properties or key terms, or to exclude sections of a document from the index.

8.1.1.7.2 Knowledge Organizer

Knowledge Organizer is sold as an add-on to Information Server. Knowledge Organizer is positioned as a pragmatic solution to the problems of managing information delivery via an intranet. Knowledge Organizer enables the automatic classification, organisation and navigation of information based on standard concepts such as organisational structure, products, customers or competitors.

8.1.1.7.3 AgentServer

AgentServer is an additional module to Information Server that provides push technology within the Verity product family. When a user logs on to their home page, they see the documents delivered since their last log-on or, for example, over the last week. Delivery can be to an e-mail address, pager, web page or even to a browser ticker tape if desired. Users can define their own agents, but a more common process is to have shared agents for different categories of search to which users subscribe as needed.

8.1.2 On line project spaces for team work

8.1.2.1 BSCW

Overview

The BSCW is a web based groupware system with full document management facilities, flexible role based access rights, shared group calendars and much more. BSCW allows you to improve your internal and external group collaboration.

The BSCW system is based on the notion of a shared workspace, a joint storage facility that may contain all kinds of objects such as documents, tables, graphics, spreadsheets or links to Web pages. Once a workspace has been set up, all members can upload, edit or download documents to it.

The BSCW system will keep the members of a group informed about each other's relevant activities in the shared workspace. Besides user and group management, the BSCW system maintains the stored documents and applies access control mechanisms to the shared workspaces.

Additional information

The BSCW system is extended in the ITCOLE project in an e-Learning delivery platform (BSCL/Synergia).

References/Links

<http://www.bscw.de/>

8.1.2.2 QuickPlace

QuickPlace is a browser-based application, that as its name indicates, its purpose is to allow a team to set up a virtual, secure workspace very quickly and be up and running in no time. Using their browsers, team managers can quickly open and furnish a space, and invite members by using existing directories as well as adding external names. Subgroups of members can also create their own private rooms.

Members primarily design the space for asynchronous access, but presence awareness, instant messaging, and chat facilities allow them to do some synchronous work as well. The document storage has all the basic features: folders (of multiple types), elementary document management and version control, and full-text indexed search. To facilitate sharing and integration with other application, a sophisticated publishing facility allows documents authored outside of QuickPlace to be viewed by team members through their browser (whether or not they have the native application), yet still continue to be edited in their native format. For project management, tasks can be defined, assigned to members, and displayed in the calendar or on a Gantt-chart timeline. Reminders can be sent when deadlines approach. Customized forms and workflow processes can also be created using the browser. At the end of the project, the space can be stripped of project-specific information and saved as a template for other projects of the same type.

8.1.2.2.1 Advantages

- Well-established platform. Can work in stand-alone mode or in conjunction with Lotus Domino.
- Easy to start a project: quick self-service setup of the space by the team manager.
- Well integrated with common business applications such as Windows Office.
- Multiple levels of customisation to accommodate both team managers and software developers.

8.1.2.2.2 Disadvantages

It is relatively costly. (Only some products are available for free.)

8.1.2.3 Other tools (not reviewed)

EProject	<i>eProject.com</i> www.eproject.com/newsite/enterprise.htm
Project Prism	<i>ZXVC/Prism</i> http://12.19.136.102/asp/demo_doc
Virtualteams	<i>Virtualteams.com</i> www.virtualteams.com
Teamroom	<i>Lotus Development Corporation</i> www.lotus.com/products
BungoPro	<i>Bungo.com</i> www.bungo.com
OpenItems	<i>Openitems.com</i> www.openitems.com
SharedPlanet	<i>Skydesk Inc.</i> www.sharedplanet.com

8.1.3 Community management

8.1.3.1 OpenACS

Overview

OpenACS (Open Architecture Community System) is an advanced toolkit for building scalable, community-oriented web applications.

It is a set of modules that form a sophisticated toolkit for general website management with a community orientation. The main market seems to be customer communities, but the toolkit is sophisticated and extendable enough that it could be used to build support for other kinds of Web communities/networks.

8.1.3.1.1 Overall description

The toolkit includes five sets of site-building tools, which represent the company's model of an online community. Each set contains a series of modules for accomplish various tasks.

- *Publishing*: authoring, editing, and approving content, banners, and design templates, as well as filtering content, FAQ's, polling, surveying, etc.

- *Personalization*: registering members, tracking their activities, helping them find relevant content and navigate, building user profiles, personal portals, subgroups, access control, etc.
- *Collaboration*: sharing and accessing information from any web browser, bulletin boards, discussion groups, chat rooms, web-based email, calendar, bookmarks, address books, file storage, presentations.
- *Transaction*: E-commerce capabilities, including collaborative filtering, recommendation tracking, classifieds, auctions, security, auditing and online reporting.
- *Site Management*: auditing, directory, statistics, search, and logging and responding to user inquiries and requests.

Technology

OpenACS runs on AOLserver, a web/application server, Oracle, the industry standard relational database, or PostgreSQL, a true ACID-compliant RDBMS. AOLserver and PostgreSQL are both available for free under open-source licenses. ACS is an open source system.

Advantages

- Open source implies a whole community of developers who are constantly extending and improving the software.
- New releases come out every eight weeks. The system is constantly evolving.
- Because of the open source approach, you are less dependent on ArsDigita itself as you have a whole community of independent entities developing the platform

Disadvantages

This complex toolkit will require sophisticated expertise on the part of system administrators, who need to become members of the developers' community.

Additional information

OpenACS is a follow-up of the ArsDigita Community Systems (that was absorbed by Red Hat).

OpenACS is used to develop the .LRN e-learning platform.

References/Links

<http://openacs.org/>

8.1.3.2 Mongoose

8.1.3.2.1 Overall description

The purpose of the company is to build the “operating system” of community support with an emphasis on membership management. The system is designed according to a model of communities. Mongoose focuses on what defines membership and motivates people to participate. It is based on a series of 12 principles of community building, such as the centrality of common purpose, the need for identity, the importance of reputation, the issue of governance, or the value of boundaries.

For each of these principles, the company intends to produce a parameterised module that manages that aspect of community: an “identity manager” a “reputation manager” or a “communication manager.” To manage all these managers, Real Communities

has designed a “workbench,” a general administration “console” that allows system administrators to customize the site, manipulate the variables of the various manager programs (e.g., set the rules of what behaviours give people points on their reputation scale), and monitor the community in general and the behaviour of individual members.

This “operating system” level is a kind of mid-level design, below specific applications, but above raw utilities. Below, Mongoose incorporates utilities as “peripheral” such as discussion boards or file management systems. Above, the company (and presumably others eventually) design specific applications, like the mentoring facility Mongoose Experience.

8.1.3.2.2 Advantages

- Built explicitly on a theory of how communities function and what leads people to participate in them.
- Provides an integrating infrastructure for “plugging in” a variety of modules.
- Console makes community management easy for people with very different levels of programming ability, from system designers to non-programmer community facilitator.

8.1.3.3 Disadvantages

- Fairly costly.
- Focused almost exclusively on membership management (but could be an advantage from an integration standpoint).
- Not yet fully functional. While the company’s overall vision holds a lot of potential, the current system is only a very partial realization of that vision.

8.1.3.4 Agilience – Sharenet

8.1.3.4.1 Overall description

Agilience is a company that is built on two projects that gained world-wide recognition: the Eureka project, driven by the need to enhance performance in Xerox’ service processes, and the Sharenet project, the global knowledge sharing network for ICN (Information and Communication Networks), one of Siemens’ largest divisions.

Agilience offers the Sharenet technology as a platform to facilitate people-to-people interactions. Integrated into an enterprise portal, the Sharenet Workspace features community functions to get in touch with other people, such as discussion forums, practice group and urgent requests, as well as access to codified knowledge, via Best-Practice Process modules and structured knowledge assets inventory. Nevertheless, the emphasis of Sharenet is not on providing “document repositories”. It provides a network that has been explicitly designed as an interactive medium. Instead of functioning as an infrastructure that exists alongside people’s actual work, Sharenet functions as a business application helping employees solving specific customer problems.

8.1.3.5 Communispace

8.1.3.5.1 General description

Like many systems designed to support online communities, Communispace is a browser-based system that provides a virtual space for participation. What distinguishes Communispace is the company’s effort to provide explicit support for

typical activities that focused communities engage in, during their formation and their ongoing work. As a result, Communispace provides facilities for activities such as framing issues, brainstorming, making decisions, or analysing the “community climate,” in addition to more traditional facilities such as asynchronous discussions, chat, calendar, organizing documents, and creating profiles of users. This support is based on a model of these activities and provides direction for the process. For instance, the brainstorming facility will take the group through the various phases of brainstorming: generating ideas, discussing them, ranking them, and selecting. By focusing on activity structure and social dimensions in combination, Communispace uses technology to encourage participants to engage in community-oriented activities. This includes reflection on the quality of the community in terms of relationships, level of trust and participation, nature of conversations, etc. Even for the more traditional offerings, Communispace has a few original touches that reflect attention to the nature of activities. For instance, its asynchronous discussion facility requests contributors to categorize their contribution according to a taxonomy of ten different “speech acts” including question, answer, request, offer, assent, dissent, etc.

Because Communispace places the emphasis on enforcing or fostering community-oriented behaviour through the technology, it expects members to use the community space as their primary interaction locus, rather than, say, email. In this sense it may require difficult behavioural changes. For use in a broader work context, the system may not always provide enough ways to integrate with others systems people use. The ability to handle documents in a knowledge base is still underdeveloped for a full community. The search facility only works on keywords. Communispace is developing links to some of the major search engines and knowledge-base systems. In addition, it is working with a partner to develop some native full-text search capability for customers who do not have access to these other systems.

8.1.3.5.2 Advantages

- Community-oriented design, based on a sophisticated model of community activities.
- Actively encourages community-building behaviour.
- Based on a method to build communities, which is part of the service.

8.1.3.5.3 Disadvantages

- Relatively expensive for informal communities, in part because of the bundled administrative services.
- Not really a self-service system.
- Lacks document sharing infrastructure

The behavioural directiveness may require excessive commitment for looser communities.

8.1.3.6 Astound Conference Centre

Astound Conference Centre is intended for moderated meetings of various sizes. It is a browser-based application that includes all the features listed above. Prior to the meeting, the moderator loads up the presentation and invites participants (with the option of limiting access with a password for the conference). The conference can start right away or be scheduled for a specific time. The system will manage the flow of attendees, and even test their browser to make sure they will be able to participate

fully. During the meeting, more than one moderator/presenter can take turn facilitating the interactions. The facilities support two modes of interaction.

- In the conferencing mode, the moderator runs a presentation or a web tour. The audience can show their reaction by using “emoticons” or ask the presenters to slow down. Attendees can also chat, ask questions, and even open private side conversation groups in the chat window (an ability moderators can turn off).
- In the collaboration mode, moderators open shared applications or white board, which all participants can also access. In this case, the whole group is actively involved on the screen.

Meetings can be recorded and archived for later viewing by those who could not attend.

8.1.3.6.1 Advantages

- Easy set-up with clear interface.
- Platform-independent
- The flat fee per attendee makes the use of the system quite affordable.
- Can support thousands of users simultaneously.

8.1.3.6.2 Disadvantages

Moderators have to decide in advance exactly what slides to use because presentations must be uploaded prior to the conference.

8.1.3.7 Comments

Conferencing systems like Astound have become really easy to use and the prices have come down.

8.1.3.8 Other Tools (not reviewed)

PlaceWare	<i>PlaceWare, Inc.</i> www.placeware.com PlaceWare attempts to reproduce the experience of being in an auditorium.
Webex	<i>Webex Communications, Inc.</i> www.webex.com Similar to Astound, but also includes a virtual office space where people can visit even when the “owner” is not present, leave messages, add to the calendar, etc.
Evoke	<i>Evoke Communications, Inc.</i> www.evoke.com
Centra	<i>Centra Software</i> www.centra.com
Marratech Pro	<i>Marratech AB</i> www.marratech.com
iMeet	<i>iMeet.com</i> www.imeet.com

OneStopMeeting	<i>Teamwave Software Ltd.</i> www.OneStopMeeting.com
The Virtual Meeting	<i>RTZ Software</i> www.rtz.com
SameTime	<i>Lotus Development Corporation</i> www.lotus.com Suite of products including: awareness, chat, application sharing, on-line meeting (includes Netmeeting)
ConferenceRoom	<i>Webmaster.com</i> www.webmaster.com Providers of chat servers for large applications.
Chatspace	<i>ChatSpace Inc.</i> www.chatspace.com
Tapped in	<i>SRI International</i> www.tappedin.org Chat-oriented virtual space for educators to form communities, discuss issues and share knowledge. The space is also used for some experimental distance-learning programs.

8.1.4 Knowledge exchange and expert finder tools

8.1.4.1 Orbital Organik

8.1.4.1.1 Overall description

Organik provides access to information through a question/answer format. A user enters a question into the system. First, Organik attempts to match the question with a list of previously answered questions. The answers are ranked according to the likelihood that they will be relevant, including the success that the authors of the answers have had in answering questions in the past. If Organik cannot find a ready answer or if no answer satisfies the user, it will suggest a list of “experts” from its roster who are likely to provide an answer. It then lets the user select the set of experts to whom the question should be directed. The user can be notified by e-mail when an answer is coming back. If no answer is forthcoming, the system can keep the question alive and respond to the request when an answer becomes available. When given an answer, the user is invited to provide feedback on that answer. This feedback is used to update the profile of the “expert.” Organik keeps a profile of each user of the system, which includes not only personal information, but also the history of questions posed and answers provided in various areas of expertise. If the feedback is positive, the answer is also entered into the database of answers for further use. Over time, Organik builds a database of answers organized into areas of interest.

Organik also provides facilities for discussions. Any answer can turn into a discussion, which others can join. In fact, asking questions is not the only way to access expertise. Each area of interest defines a “community of interest,” which are listed on the front page, and which users are invited to join by browsing the store of knowledge and participating in discussions.

Organik provides administration functions associated with these communities, including community and user metrics and rating of questions and answers.

8.1.4.1.2 Comments

Organik can build communities of interest progressively, without having to build a large repository up front, or even knowing who belongs. The system can also be used as a module in a more general community platform.

8.1.4.2 Knexa

8.1.4.2.1 Overall description

Knexa.com Enterprises Inc, is a public company, which trades on the Canadian Venture Exchange. Knexa created the world's first knowledge auction, a patent pending e-commerce application that applies dynamic pricing to digital goods such as codified knowledge, software, and multimedia content. Since the launch of the web site, Knexa has attracted a number of companies and institutes to participate in the marketplace, such as The Delphi Group Canada and KIKM, as well as Knowledge Management and Intellectual Capital experts, like Nick Bontis and Lief Edvinsson, who have joined the management team and the advisory board.

Besides the marketplace facility, Knexa provides software and professional services in the era of Knowledge Management. Knexa's approach involves enterprise software and business methods that foster knowledge sharing in organizations, with the use of an innovative recognition and reward system.

The business community of Knexa.com consists of buyers and sellers of business ideas and information and provides the expedient protocols for the participants to set a fair market value on their knowledge.

The major goal of Knexa.com is maximizing its revenues that are generated through a 20% transaction fee charged to the knowledge seller. Buyers use the services of the marketplace for free. Once a transaction is agreed the buyer's credit card is debited and an 80% of the payment is transferred to the seller's account. The rest 20% is credited to Knexa.

In order to achieve its goal Knexa has focused on customer acquisition and providing market liquidity – the ability for the marketplace members to quickly and easily transact business and receive value - deducting search and negotiating costs. To attract as many participants as possible in the marketplace it should be clear how value is added to them. This added value consists of rich content from a broad range of thematic areas available, covering interests from business to home & house, a pricing mechanism allowing users to set a fair price for their items and a variety of means to spot the wanted information.

8.1.4.3 Other Tools (not reviewed)

AskMe

AskMe corporation www.askmecorp.com

AskMe is as a public question and answer service (www.askme.com), but the company now offers its knowledge exchange engine for corporate applications.

Clerity Knowledge Exchange *Clerity* www.clerity.com
Question/answer engine.

8.2 Platforms Developed by the different partners of the LIP project

8.2.1 ICDT (INSEAD)

Overview

The ICDT Platform is a web-based virtual environment aimed at supporting distributed groups and communities. The platform is the result of research and development efforts conducted at INSEAD's Centre for Advanced Learning Technologies since 1994 in the domain of groupware design and collaborative, distributed learning. Different versions of the ICDT Platform have been employed and are actively used to support a number of applications, including:

- Virtual Learning Communities and Knowledge Exchange applications,
- Project and Document Management applications and
- Service and Product Development and Distribution applications.

Implementation Details, Openness and Tailorability

From an implementation perspective, the ICDT Platform has been developed using as a middleware the two IBM middleware packages Notes/Domino and Sametime. This choice has guaranteed over the years a high flexibility in extending the platform to fit specific needs by either using the open implementation frameworks built into this middleware or flexibly connecting (or import/export data or services) for instance through Java code (special functionalities), XML (connection to a Flash interface) or ODBC (data export and import to a personalized UI developed in the programming language Metacard).

The quality and scalability of this middleware underlying the ICDT Platform is guaranteed by several successful cases like the current website of IBM Australia developed using the same technological options (although without the integration of SameTime API elements). The use of middleware such as Domino/SameTime and Flash also increases reusability and integrability of components developed, leveraging the extensive user basis (in business, government, education, research as well as other contexts) and developers community.

Research wise, as extensive number of projects addressing e-Learning, community and 'social' computing are using the same technological platform for conducting research on features particularly relevant to the use of ICT in social contexts. INSEAD's research agreement with IBM and its Research Labs in Haifa, Israel, and in the US, will guarantee the link to a state-of-the-art research and developments stream in the area of social computing which is relevant to e-Learning-related projects and to which the project can definitely contribute.

The middleware on which the ICDT Platform is implemented guarantee a high level of openness and inter-operability with different standards, and hence the possibility to tailor a number of components to the specific needs of other environments built 'on top' of it or attempting to integrate it with other software modules.

Additional information

The ICDT technology is used in the EdComNet project.

References/Links

<http://www.insead.edu/calt/>

8.2.2 teamWorks (CAS)

Overview

CAS Software AG has two primary products – GenesisWorld and teamWorks. GenesisWorld is a CRM/Knowledge management/Groupware system used to help companies to organize their knowledge both internal and customer related knowledge. CAS teamWorks is an innovative new product that allows companies to quickly build their own personalized company intranet portals through a standard portal manager and also to create their own functionally complex components for the portal. CAS teamWorks is based also on the GenesisWorld architecture.

genesisWorld has been developed for small and medium sized enterprises and won the [European IT-prize 1998](#).

Technology used

GenesisWorld uses the Microsoft COM+ component environment (Component Object Model). CAS teamWorks is based on COM and ISAPI Web Server Extensions. Both products have been developed mainly in Delphi.

Additional information

CAS is currently working on a project aimed at adding LMS (Learning Management System) capabilities to its teamWorks platform. The goal is to help employees to learn what they need integrated into business processes and their everyday work.

References/Links

<http://www.cas.de/>

8.2.3 KnowNet (Meta4)

Overview

KnowNet makes strategic knowledge management possible through **knowledge gap analysis**. This is done by dynamically identifying the knowledge required by the company at any given time and the degree to which this knowledge already exists in the organization. This technology, when used together with a discussion forum, allows the complete analysis of knowledge needs, identifies expert sources, creates communities of practice, and serves as a planning tool for future knowledge deployments, with the ultimate goal of taking full advantage of existing knowledge in the organization in order to obtain a competitive advantage. This advantage is gained by reducing market cycles, by increasing the quality of innovation and continually improving performance. This results in increased customer satisfaction, rapid adaptation to a changing environment, and the achievement of operational and strategic goals.

The application includes a Knowledge Profiling Agent that tracks the knowledge levels of each KnowNet user and updates that information based on their use and creation of knowledge, optionally filtered by the feedback from other users on the knowledge they create. When used in conjunction with self-assessment and performance appraisals, a complete picture of formal competencies and subject matter expertise results.

The Four Main KM Components

The four broad areas of functionality embedded in the application are:

- Intelligent Inference.
- Knowledge Repository Management.
- Collaboration Tools.
- Personalized Information Portal.

9 Annex 4: E-Learning Initiatives, Standards & Systems

9.1 Initiatives

9.1.1 IMS Global Learning Consortium

Description

IMS Global Learning Consortium

<http://www.imsglobal.org/>

The IMS Global Learning Consortium develops and promotes the adoption of open technical specifications for interoperable learning technology. Several IMS specifications have become worldwide de facto standards for delivering learning products and services.

Additional Information / Comments

IMS is a worldwide non-profit organization that includes more than 50 Contributing Members and affiliates. These members come from every sector of the global e-learning community. They include hardware and software vendors, educational institutions, publishers, government agencies, systems integrators, multimedia content providers, and other consortia. The Consortium provides a neutral forum in which members with competing business interests and different decision-making criteria collaborate to satisfy real-world requirements for interoperability and re-use.

9.1.2 IEEE Learning Technologies Standards Committee (LTSC)

Description

IEEE Learning Technologies Standards Committee

IEEE LTSC is a body that promotes the creation of an ISO standard, a widely accepted true standard. The LTSC is responsible for preparing technical standards, practices and recommended guidelines for computerized usage of components and educational and training systems, in particular, software components, tools, technologies and the design methods that make development, rollout, maintenance and interoperability easier.

References:

<http://ltsc.ieee.org/>

9.1.3 The Open Knowledge Initiative

Description

The Open Knowledge Initiative

<http://web.mit.edu/oki/>

The Open Knowledge Initiative (OKI) is a group of MIT-led universities working together to define an architecture that will specify how the components of a learning

technology environment communicate with each other and with other campus systems.

The result of this collaboration is an open and extensible architecture that specifies how the components of an educational software environment communicate with each other and with other enterprise systems. O.K.I. provides a modular development platform for building both traditional and innovative applications while leveraging existing and future infrastructure technologies.

The OKI architecture relies on two layers: (1) the Common Services layer, provides hooks to institutional infrastructure and other fundamental services that provide a backbone for higher level services and applications; (2) the layer Educational, will bundle functionality that is of particular usefulness to the developers of various kinds of educational software applications.

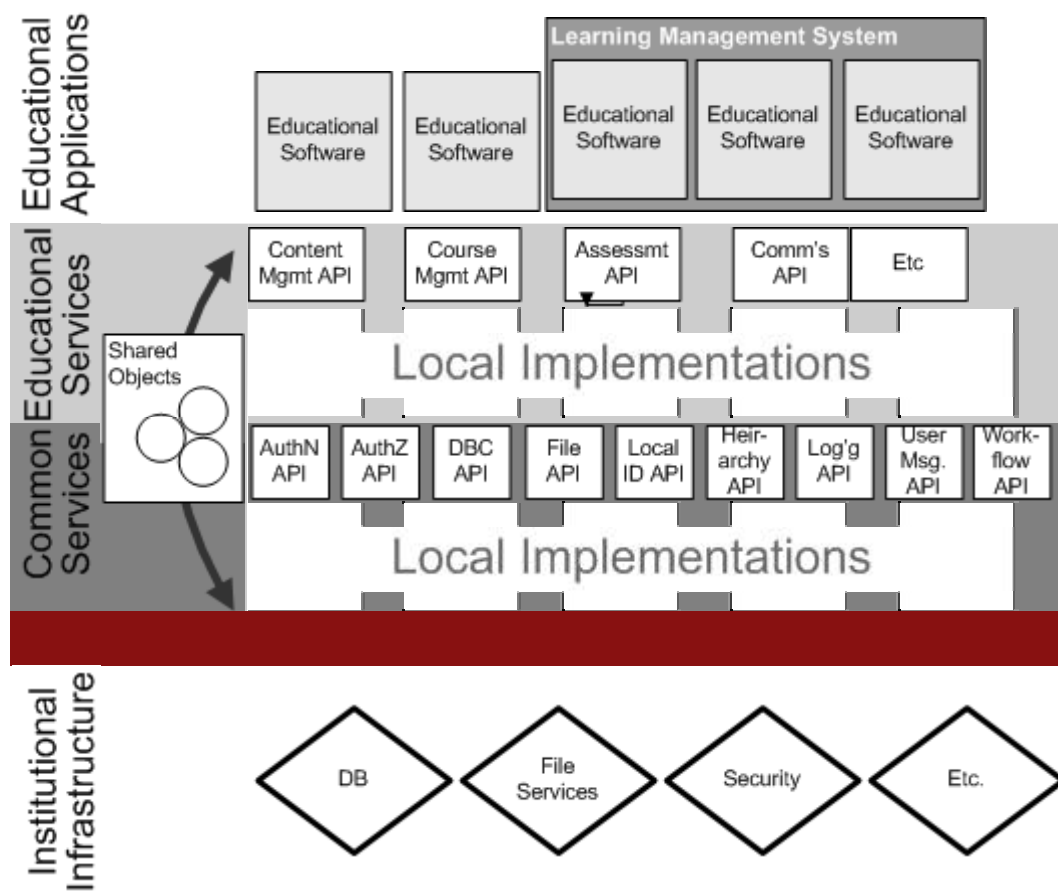


Figure 1: OKI architecture overview

Additional Information / Comments

Several open source systems are now relying on the OKI initiative such as Stanford's CourseWork, or the University of Michigan's CHEF system.

9.1.4 The Open Archives Initiative

For the description and details of “Open Archives Initiatives” please refer: “ 6.3.6 Open Archives Initiative (US-NSF) ”.

9.2 Standards

9.2.1 SCORM (Shareable Courseware Object Reference Model)

Overview

SCORM is a product of the Advanced Distributed Learning (ADL) initiative. The SCORM defines a Web-based learning "Content Aggregation Model" and "Run-Time Environment" for learning objects. It is a collection of specifications adapted from multiple sources to provide a comprehensive suite of elearning capabilities that enable interoperability, accessibility and reusability of Web-based learning content. The work of the ADL Initiative to develop the SCORM is also a process to knit together disparate groups and interests. This reference model aims to coordinate emerging technologies with commercial and/or public implementations.

Scope

SCORM is intended to provide three main capabilities:

- Move courseware content from one Learning Management System (LMS) to another.
- Permit reuse of executable content elements within multiple LMSs.
- Provide information about course, content, and raw media elements to facilitate their reuse.

In the Annex, all the projects that are implementing SCORM are commented upon, explaining the level of interest that they show in SCORM, etc.

In D1.4, the reader can find information regarding, for example, SCORM 1.2 version. Further work has been developed in order to improve this version and provide more capabilities for content developers, learning designers and learning management system (LMS) vendors in general. Following are listed the main changes that SCORM 1.3 version. Changes are located in:

9.2.1.1 SCORM Content Aggregation Model

The SCORM Content Aggregation Model represents a pedagogically neutral means for designers and implementers of instruction to aggregate learning resources for the purpose of delivering a desired learning experience. A learning resource is any representation of information that is used in support of a learning experience. Learning experiences consist of activities that are supported by electronic or non-electronic learning resources.

One step in the process of creating and delivering learning experiences involves the creation, discovery and aggregation of simple electronic assets into more complex learning resources and then organizing those resources into a predefined sequence of delivery. With the addition of the IMS Simple Sequencing Specification, the SCORM Version 1.3 adds this key component to the Content Aggregation Model. The SCORM Version 1.2 Content Aggregation Model consists of the following:

- **Content Model:** Nomenclature defining the content components of a learning experience. The SCORM Content Model describes the SCORM components used to build a learning experience from reusable learning resources. The Content Model also defines how these lower-level sharable and reusable learning resources are aggregated to compose higher-level units of instruction. Main changes and additions include:
 - New concept of Sharable Content Asset (SCA)
 - Addition of new SCORM Meta-data Components (SCA, Activity)

To let the reader remember, the SCORM components are the following:

Assets

Learning content in its most basic form is composed of Assets that are electronic representations of media, text, images, sound, Web pages, assessment objects or other pieces of data that can be delivered to a Web client. An Asset can be described with Asset Meta-data (see Asset Meta-data definition below) to allow for search and discovery within online repositories, thereby enhancing opportunities for reuse.

Sharable Content Asset (SCA)

A Sharable Content Asset (SCA) is a new term being introduced in the SCORM Version 1.3, however, the concept of a SCA is not new. There was always some confusion on what a piece of content was called if the content did not communicate with an LMS. In the SCORM Version 1.2 this was referred to as an Asset. However, the term Asset was also defined as an electronic representations of media, text, images, sound, Web pages, assessment objects or other pieces of data that can be delivered to a Web client. A SCA is therefore defined as a collection of one or more Assets packaged as a single launchable resource. The SCA is different than the Sharable Content Object (SCO) in the sense that the SCA does not communicate with an LMS via the SCORM Communications API Adapter. A SCA can be described with SCA Meta-data to allow for search and discovery within online repositories, thereby enhancing opportunities for reuse.

Sharable Content Object (SCO)

A SCO represents a collection of one or more Assets that include a single launchable resource that utilizes the SCORM Run-Time Environment to communicate with Learning Management Systems (LMSs). A SCO represents the lowest level of granularity of learning resources that can be tracked by an LMS using the SCORM Run-Time Environment Data Model. The only difference between a SCO and a SCA is that the SCO communicates with an LMS using the SCORM Run-Time Environment Communications API. To be reusable, a SCO by itself should be independent of learning context. For example, a SCO could be reused in different learning experiences to fulfill different learning objectives. In addition, one or more SCOs can be aggregated to form a higher-level unit of instruction or training that fulfills higher-level learning objectives. SCOs are intended to be subjectively small units, such that potential reuse across multiple learning objectives is feasible. A SCO can be described with SCO Meta-data to allow for search and

discovery within online repositories, thereby enhancing opportunities for reuse. A SCO is required to adhere to the SCORM Run-Time Environment. This implies that it must have a means to locate an LMS's Communication API Adapter and must contain the minimum API calls (LMSInitialize (“”) and LMSFinish (“”). There is no obligation to implement any of the other API calls as those are optional and depend upon the nature of the content. The requirement that a SCO participate in the SCORM Run-Time Environment yields the following benefits:

- Any LMS that supports the SCORM Run-Time Environment can launch SCOs and track them, regardless of who generated them;
- Any LMS that supports the SCORM Run-Time Environment can track any SCO and know when it has been started and when it has ended; and
- Any LMS that supports the SCORM Run-Time Environment can launch any SCO in the same way.

- **Meta-data:** A mechanism for describing specific instances of the components of the content model. Meta-data represents a mapping and recommended usage of the IEEE LTSC LOM elements for each of the SCORM Content Model components. In general, guidance is provided for meta-data to be applied to Assets, SCAs, SCOs, Learning Activities and Content Aggregations to describe them in a consistent fashion such that they can be searched for and discovered within and across systems to further facilitate sharing and reuse. Main changes and additions include:
 - Integration of changes to support IEEE 1484.12.1-2002 Learning Object Metadata
 - Updates to the SCORM Meta-data Information Model
 - Updates to the SCORM Meta-data XML Binding
 - Updates to the SCORM Meta-data Application Profile (SCA and Activity)

To let the reader remember, the SCORM Meta data treats the following:

Content Aggregation Meta-data

Content Aggregation Meta-data describes the content aggregation. The purpose of applying Content Aggregation Meta-data is enable discoverability within a content repository and to provide descriptive information about the aggregated content represented by the content package.

Activity Meta-data

Activity Meta-data describes the individual activities found in a content package. The purpose of applying Activity Meta-data is to make the activity accessible within a content repository. The meta-data should describe the activity as a whole.

SCO Meta-data

SCO meta-data can be applied to SCOs that provides descriptive information about the content represented in the SCO. This meta-data is used to facilitate reuse and discoverability of such content within, for example, a content repository.

SCA Meta-data

SCA meta-data can be applied to SCAs that provides descriptive information about the content represented in the SCA. This meta-data is used to facilitate reuse and discoverability of such content within, for example, a content repository.

Asset Meta-data

A definition of meta-data that can be applied to “raw media” Assets that provides descriptive information about the Asset independent of any usage or potential usage within courseware content. This meta-data is used to facilitate reuse and discoverability, principally during content creation, of such Assets within, for example, a content repository.

- **Content Packaging**: Defines how to represent the intended behavior of a learning experience (Content Structure) and how to package learning resources for movement between different environments (Content Packaging). Main changes and additions include:
 - Terminology changes for what learning resources are launchable (Asset – SCA)
 - Change to only permit leaf nodes to reference learning resources (Based on integration of IMS Simple Sequencing Specification).
- **Sequencing**: Addition of a Sequencing Definition Model, which is a rule-based model for defining how to sequence and deliver learning resources at run-time. This model defines a set of conditions and corresponding actions or behaviors that must be performed if the set of conditions evaluates to true
 - Integration of the IMS Simple Sequencing Specification
 - Introduction of a basic Navigation capability to compliment the sequencing specification

SCORM Run-Time Environment (RTE)

- Changes to the SCORM Run-Time Environment Data Model to supplement the integration of the IMS Simple Sequencing Specification.
- Changes that require the mandatory implementation of all SCORM Run-Time Environment Data Model elements

9.2.2 EML (Educational Modelling Language)

Overview

The Open University of Netherlands has developed the Education Modelling Language (EML). EML is a comprehensive notational system that allows one to codify units of study (e.g. courses, course components and study programmes), in an integral fashion. EML describes not just the content of a unit of study (texts, tasks, tests, assignments) but also the roles, relations, interactions and activities of students and teachers. The major EML implementation is in XML (eXtensible Mark-up Language), an internationally accepted meta-language for the structured description of documents and data.

9.3 Open Source Systems

9.3.1 ATutor

Description

ATutor is an Open Source Web-based Learning Content Management System (LCMS) designed with accessibility and adaptability in mind. Administrators can install or update ATutor in minutes. Educators can quickly assemble Web-based instructional content. Students learn in an adaptive learning environment.

Technologies used

ATutor 1.1: The software requires PHP, MySQL and Apache web server software or Microsoft Internet Information Server (IIS) software.

Additional Information / Comments

ATutor is a promising system that provides good documentation, ease of installation, and strong potential for development. While the user interface may not seem intuitive to many, the overall functionality is good (and wide open/modular) and the development team is committed to standards. The system is also install-friendly and receptive to new language versions.

The development team shows commitment towards standards.

9.3.2 Bazaar

Description

Bazaar is a web content hosting platform, designed with users (and administration) in mind. Its content-management system, coupled with a flexible permission system –not to mention a modular design and mature API allows for easy extension and integration into existing administrative systems.

Technologies used

The software requires Apache web server software, Perl 5.005, and CPAN modules, which are bundled with the system.

Additional Information / Comments

Bazaar provides an active journaling structure and good collaboration. It also has basic course management features and a nice RSS feature. The system is being developed actively but is not recommended for large deployments yet.

9.3.3 Bodington

Description

<http://bodington.org/>

<http://sourceforge.net/projects/bodington/>

The Bodington System is a software tool that can be used, in conjunction with a database product, to implement an interactive web site. Its original purpose was to implement a virtual learning environment for the University of Leeds - Bodington Common - but it could be used as the basis for other kinds of interactive site. It would more correctly be described as an application server since modules can be plugged into it to implement different functionality.

Technologies used

The Bodington system has some features like a multi-user operating system but one that is accessed via a world wide web interface.

The Bodington system is written in Java.

Licensing:

Free, and no string attached.

9.3.4 ClassWeb

Description

ClassWeb lets instructors easily create and control a class Web site, without learning HTML, FTP or getting a UNIX account. Instructors just need a standard web browser and a username and password to administer their class sites. Instructors teaching in your building, across campus, or even overseas can all get to their sites, change them, and update materials the same way. The main advantage of ClassWeb is that it offers an easy, low or no training route for faculty to administer a Web site. And because ClassWeb is open source, administrators and staff programmers have extraordinary control. Once you install and customize ClassWeb for your environment, you can change its component programs and "look" as much or as little as you want.

Technologies used

ClassWeb 2.0: The software includes remote administration tools through a command line interface. The software requires Apache 1.3.6, PHP 3.0.7, Perl 5.005, CGI.pm, MySQL, and Matt Wright's WWW Board.

Additional Information / Comments

ClassWeb is a Web site management system for Social Sciences faculty at UCLA. The system allows faculty to create and manage course Web pages, upload files, create links, and send announcements and e-mail. There is no activity or assessment generation, grade book, or tracking. In addition, ClassWeb was not created as a largely scalable system.

9.3.5 CHEF Initiative

Description

CHEF Initiative

<http://www.chefproject.org/>

The CompreHensive collaborativE Framework (CHEF) initiative has as its goal, the development of a flexible environment for supporting distance learning and collaborative work, and doing research on distance learning and collaborative work. University of Michigan School of Information and Media Union staff, staffs this project. Contributions are made to the OKI reference architecture, and are collaborating with other groups interested in open source collaboration standards. Communities targeted for CHEF use include those involved in the scholarly activities of teaching, learning and research at the University of Michigan, and their students and colleagues involved in teaching, learning and research that are outside of the Michigan community.

The CHEF team is adding collaboration specific enhancements to Jetspeed. CHEF tools are portlets, which run in the Jetspeed environment.

Technologies used

CHEF is a Java J2EE (Servlet) based application server. Applications are provided to the users by using one or more CHEF servers that work together. Users use standard web browsers and other standard client software (email, WebDAV) to interact with CHEF. Inside the CHEF web application is a Portal Engine, a set of tools, a set of services, and site configuration.

Additional Information / Comments

CHEF is an on-line service that supports working communities: communities of scientific researchers, communities of teachers and students, people who work together in person as well as those who are geographically separated. People in the community use CHEF to access computing facilities, to share resources, to communicate with one another, to facilitate meetings, to work together. They access CHEF through the web from any Internet terminal with a supported browser, from their desktop or laptops or hand held devices or phones, or from public terminals. The community can host a CHEF server of its own, or work with a CHEF service run on its behalf. CHEF users can extend the capabilities of CHEF to add capabilities specially needed by their community.

As a member of the OKI initiative, University of Michigan is a strong proponent of open standards.

For more information on the architecture of CHEF please visit:
http://chefproject.org/project/doc/specs/concepts/chef_architecture.html

9.3.6 Claroline

Description

Claroline
Open Source Course Management System
<http://www.claroline.net/>

Claroline is an Open Source software package allowing the teacher to create, administer and add to his/her courses through the web.

To use Claroline the software required would be:

Server side: Linux, Apache, PHP, MySQL, Postfix (or Sendmail), Claroline and
Client side: Any browser.

Technologies used

Claroline uses only open formats and languages: PHP, SQL, HTML. It accepts any file type but encourages open formats.

Additional Information / Comments

Claroline's comments about using standards:

"As for educational norms (SCORM, IEEE...), we are open to them but we think it is too early yet."

9.3.7 Colloquia

Description

Colloquia

(Colloquia was formerly known as Learning Landscapes)

<http://www.colloquia.net/>

Colloquia is a software system that supports group working and group learning. It allows any user to set up a working or learning group around a particular topic (a context), add people to it, add resources (web pages, documents etc) to it, set up group tasks, and then engage in group and personal "conversations" about the topic. Colloquia is free for use within non-profit educational establishments - schools, colleges and universities. Training and education providers who charge for courses can negotiate a per seat license for each paying learner. The team developing Colloquia is currently making it an Open Source project.

Technologies used

Colloquia is a groupware product ideal for collaborative management of projects and course assignments. It is an entirely distributed system and does not feature any server software or central administration. Its strength is in ease of use and control as the software actually resides on each individual user's machine. It does not currently support Web publishing, however, and its lack of server software makes it inadequate for large deployments or as an enterprise solution.

Additional Information / Comments

Colloquia has been used in a number of JISC-funded projects such as:

- **The RELOAD Project**, which focuses on the development of tools that are based on emerging learning technology interoperability specifications, in order to (1) facilitate the creation, sharing and reuse of learning objects and services; (2) enhance the range of pedagogical approaches realisable through the use of lesson plans.
- **The CO3 Project**, which is a partnership between the Universities of Bangor, Huddersfield and Staffordshire concerned with the implementation of IMS specifications to achieve interoperability between their Virtual Learning Environments (VLE) - Colloquia, CoMentor and COSE.

9.3.8 coMentor

Description

coMentor

<http://comentor.hud.ac.uk/>

coMentor is software, which allows you to create multi-user learning environments on the WWW, which are accessible without the need for any special client-side software. The system provides a collaborative virtual environment in which students can take part in real-time and asynchronous discussion, along with a set of learning tools to support debate and collaborative work. coMentor is particularly aimed at arts, humanities and social science courses, where learning centres on discussion and textual resources.

Technologies used

The coMentor software consists of 3 components:

- A MOO (an object-oriented multi-user domain). The MOO consists of 2 parts:
 1. The MOO program (written in C) which facilitates access to:
 2. The MOO database. (A database of text objects (e.g. users, areas))
- Java programs:
 - SpeakandPage*: It is an applet that facilitates user-to-user communication via the MOO.
 - MOONotes2*: It is an annotation applet (displays text in a format that can be annotated).
 - MOONotes*: It is a Java server application used by the *SpeakandPage* and *MOONotes2* applets.
 - jKSImapper*: It is a concept mapping server/applet.
- Perl scripts: provide a discussion list feature.

Additional Information / Comments

To run the coMentor server software, users need a UNIX or a LINUX computer and a Web server. Users can access coMentor from any computer connected to the WWW that supports Java (e.g. Macs/Win 95/98/NT plus Netscape/IE 3.0 or above).

9.3.9 COSE

Description

COSE

Creation of Study Environments

<http://www.staffs.ac.uk/COSE/>

COSE is a Virtual Learning Environment (VLE).

COSE enables Learning to be Learner Centred.

COSE enables Learning to be Collaborative.

Technologies used

COSE consists of CGI Perl Scripts and Java code installed on a standard http server such as Apache or IIS. COSE uses the Java 1.3.0 or later plug-in.

Note: COSE is connected to CoMentor.

9.3.10 CourseWork (US Stanford)

Description

CourseWork

<http://getcoursework.stanford.edu/>

CourseWork is Stanford University's FREE and open source course management. (Released in July 2003).

"Using CourseWork, instructors and TAs can set up a course Web site that displays announcements, on-line readings, a dynamic syllabus and schedule, on-line assignments and quizzes, a discussion forum for students, and a grade book. CourseWork is designed both for faculty with little Web experience, who can use CourseWork to develop their Web site quickly, and for expert Web-users, who can use it to organize complex, Web-based materials and link them to Web communication tools".

Technologies used

Not much information available at present.

Additional Information / Comments

CourseWork is a non-distributable system that is designed for enterprise use and scale. Stanford is a partner in the development of OKI standards and has designed a robust and stable, if general, course management platform. CourseWork provides good content management functionality with the ability to export grades into other formats for advanced calculations.

9.3.11 eConf

Description

eConf is an open source e-learning software, written in Java. It allows to easily record web sessions and has been used to record multiple computer science courses. eConf is an add-on to an HTTP proxy that is able to capture the web pages shown during the session and the voice of the presenter. The audio and the web pages are then synchronized to allow the students to listen to the recorded course.

Technologies used

EConf is written in Java. The current release of eConf is built on top of the W3C's Jigsaw proxy but any other proxy may be used. It requires a Java virtual machine 1.3 or higher and the Java Media Framework (JMF).

Additional Information / Comments

eConf is available as open source and is available under the GNU license.

9.3.12 Eledge

Description

Eledge consists of a collection of Java servlets that utilize a MySQL database back-end to store information and course content. The Java programming language,

MySQL database and Eledge itself are all open source distributions that can be downloaded free."

Technologies used

Eledge 1.2: The software requires Java servlet engine and web server software such as Tomcat or Apache. <http://eledge.sourceforge.net/>.

Additional Information / Comments

eLedge is a course management system developed by Chuck Wright at the University of Utah (Department of Chemistry). It is a full-functional CMS with excellent tracking assignment features. It features adequate documentation.

9.3.13 EPortfolio (University of Minnesota)

Description

OSPI

Open Source Portfolio Initiative

<http://eportfolio.d.umn.edu/>

The Open Source Portfolio Initiative (OSPI) is a collaborative, open source, software development project based on the University of Minnesota System's (U of MN) electronic portfolio (ePortfolio) software. The OSPI platform is an enterprise electronic portfolio application coded to J2EE standards for web applications. The OSPI core is dedicated to building the OSPI software in such a way that it simultaneously meets the needs of individuals to manage personal and professional records as well as institutions to perform system and program assessment.

Creates a secure Web infrastructure for students, faculty members, and staff members to organize, store, and share samples of their work, transcripts, resumes, and other personal information.

Technologies used

Programming Language used: Java

Additional Information / Comments

OSPI is made up of a community of users who contribute code and provide fixes to the current official iteration of OSPI (v1.0). Any individual, institution or organization may download the OSPI code to use, free of charge.

9.3.14 Fle3 (ITICOLE project)

Description

Fle3

Future Learning Environment

<http://fle3.uiah.fi/>

Fle3 is designed to support learner and group centered work that concentrates on creating and developing expressions of knowledge (i.e. knowledge artifacts) and

design. Fle3 contains three learning tools and several administration tools. Fle3 WebTops can be used by teachers and students to store different items (documents, files, links, knowledge building notes) related to their studies, organize them to folders and share them with others. WebTop also includes shared "course folder" for each course. The same shared "course folder" is available in the Knowledge Building and jamming tools as well. The items in the WebTops can be called learning objects - if you wish.

Technologies used

Fle3: The software requires Python 2.1 or newer and Zope (Z Object Publishing Engine).

Additional Information / Comments

For teachers and administrators Fle3 offers tools to manage users and courses or study projects. The administrator may also export and import courses or the full content of the Fle3 database in XML format (compatible with the Educational Modelling Language - EML).

9.3.15 ILIAS

Description

<http://www.ilias.uni-koeln.de/>

Simpler PHP/mysql solution

(Used by quite a list of educational institutions)

As a client-server system ILIAS allows users to create, edit and publish course units in an integrated system with their normal web browsers.

Technologies used

ILIAS has been developed using the server side scripting language PHP in connection with the SQL database MySQL and the Apache Web server. In its present version ILIAS requires the use of PHP4, which ideally should be configured as an Apache module. All required third-party software is available as Open Source software. The target operating systems are mainly Unix and Linux.

Additional Information / Comments

The web-based learning management system ILIAS is available as Open Source software under the GNU General Public License (GPL). Universities, educational institutions and every interested person may use the system free of charge and contribute to its further development.

9.3.16 Jones e-education

Description

Jones e-education V2003

<http://www.jonesknowledge.com/>

Jones e-education is a mature, top-of-the-line course management solution, renowned as one of the most student-friendly systems available because of its intuitive, easy

navigation and its clean interface. This version boasts all the necessary e-learning tools for assessment, communication, collaboration, community building and creation and management of online learning courses. In addition, it provides virtually unmatched flexibility for instructional design and professional content, as well as administrative oversight and control.

Technologies used

The software requires PHP, MySQL, Java 2 SDK, web server software such as Apache, and a servlet engine such as Tomcat, Jetty, or JRUN. The server administration tools can be accessed over the Web but there is also a set of server-side administration scripts. Typically, local administrators install the software.

Additional Information / Comments

The Jones Standard source code license is available without charge to appropriately accredited educational institutions only, not to individuals.

9.3.17 LON-CAPA (US-NSF)

Description

LON-CAPA

Learning Online Network with a Computer Assisted Personalized Approach

Michigan State University.

<http://www.lon-capa.org/>

LON-CAPA is an integrated system for online learning and assessment. It consists of a learning content authoring and management system allowing new and existing content to be used flexibly, a course management system, an individualized homework and automatic grading system, data collection and data mining system, and a content delivery system that will provide gateways to and from NSF's National STEM Digital Library.

LON-CAPA is a distributed open-source Learning Content Management and Assessment System that provides instructors with a common, scalable platform to assist in all aspects of teaching a course, from lecture preparation to administration of homework assignments and exams. It also enables instructors to create educational materials and to share such learning resources with colleagues across institutions in a simple and efficient manner.

Technologies used

No information is available.

Additional Information / Comments

LON-CAPA is long on functionality and support for extended character sets and computation, but it's a bit short on user friendliness. It is a robust system built for enterprise scalability and handles clustering well. This system is highly recommended as one of the most promising candidates for providing traditional course management functionality for large institutions. LON-CAPA is an active participant in the standards movement and provides strong documentation and development support.

The LON-CAPA software is freely available and free (GNU General Public License), and may be modified and adapted.

9.3.18 .LRN

Description

.LRN (OpenACS)

<http://www.dotlrn.org/>

The (.LRN) goal is to evolve the platform by harnessing the power of open source "user innovation communities." Second, the underlying architecture and technical design is based on principles taught at MIT. Third, the underlying toolkit (OpenACS) is maintained by a talented group of developers worldwide. Fourth, .LRN functionality is based on extensive testing and production use at MIT's Sloan School of Management. Fifth, .LRN will maintain a strong link to some of the best research and technology initiatives at MIT and the Sloan School of Management, including the Open Knowledge Initiative and D-Space.

Technologies used

.LRN is based on OpenACS, which is based on the TCL language.

Additional Information / Comments

.LRN is currently a collaborative communication and document-sharing tool but is on its way to adding full, traditional course management features. The strength of .LRN is in its administration and flexibility. It also handles group work well and possesses a flexible and modular architecture that makes it easy to install new features as they are added.

9.3.19 MimerDesk

Description

MimerDesk

<http://www.mimerdesk.org/>

MimerDesk is a Web-based groupware/courseware environment designed for a wide variety of uses such as personal management, computer-supported collaborative learning, carrying out projects, and setting up communities. Its main strengths include a very customizable group system which allows many groups to work simultaneously on a shared database with tools like Calendar, Tasks, Forums, Links, Chat, Reviews, Voting, Files, Instant Messages, Profiles, and many more.

Technologies used

MimerDesk 1.5.3.1: The software requires Apache, Perl, and MySQL.

Whiteboard 1.0.2: The software requires PHP 4.1.2 or later and MySQL 3.23.47 or later.

Additional Information / Comments

The MimerDesk software and all of its components are licensed under the GNU General Public License.

9.3.20 Moodle

Description

Moodle

<http://moodle.org/>

Moodle is a course management system designed to help educators who want to create quality online courses. One of the main advantages of Moodle over other systems is a strong grounding in social constructionist pedagogy.

Technologies used

Moodle 1.0.8.1: The software requires PHP 4.1.0 or later, MySQL (or PostgreSQL), a web server, a database server and either Apache web server software or Microsoft Internet Information Server (IIS) software. The software was developed using the Apache web server.

Additional Information / Comments

MOODLE is showing its commitment towards standards and is evolving towards IMS/SCORM standards.

9.3.21 Managed Learning Environment Project

Description

Managed Learning Environment Project

<http://www.mle.dmu.ac.uk/>

September 2000 - August 2002

The role of a Managed Learning Environment (MLE) is to provide a more learner-centred view, through closer integration of these separate systems. The MLE provides individual students with their own personal interface to the University's systems, via a Web-based "front-end", with the information and functions they need, at the times they need them.

The aims of the project were to assess the technical and organisational feasibility of integrating multiple technologies into a single managed learning environment at DMU, to develop a model of integration capable of generalisation to other institutional contexts, and to disseminate this to the UK educational community.

Technologies used

No information available.

Additional Information / Comments

Only students attending DMU are allowed to login to the MLE. Their details must be on the student database.

9.3.22 Open USS

Description

<http://openuss.sourceforge.net/>

The Open University Support System (OpenUSS) was designed as open platform, which offers high-level services for learning and teaching support:

- Personalized views for students and lecturers
- e-mail based distribution lists
- Subject oriented discussion groups
- Moderated chat rooms
- Archiving for off-line support

OpenUSS offers valuable services for lecturers. Lecture materials are stored in a relational database, such that course specific content can be managed consistently. In order to publish materials (e. g. slide shows, text documents and spreadsheets), lecturers just need Internet access to the OpenUSS server and a HTML browser at their working place. As a consequence of this, distance-learning concepts can be easily realized.

Technologies used

OpenUSS is based on J2EE technology.

Additional Information / Comments

Mainly German universities use OpenUSS.

9.3.23 RELOAD SCORM Player

Description

<http://www.reload.ac.uk/>

The RELOAD SCORM Player is an ADL SCORM 1.2 player, which provide a full implementation of the CMI Data Model and that is launched in a native browser and that embed a Single User Java Web Server. It implements Most Prerequisite rules (and & or | not ~ equals ="" and logical parenthesis).

Technologies used

The RELOAD SCORM Player is an application that relies on a personal Java Servlet, jsp-based application (using Tomcat) that is accessed via a traditional web browser. The active part in the web client makes use of JavaScript (no applet), for a maximum flexibility and in particular an easy deployment.

Additional Information / Comments

The RELOAD SCORM Player is free (without any string attached), and in particular includes the right to modify the software and to sell it.

9.3.24 WebMaster (Coronet project)

Description

WebMaster

<http://coronet.iicm.edu/>

GNU.

(Coronet project)

WBT-Master is a set of tools, which utilize the advanced Internet technology to facilitate and speed the flow of knowledge from possessors to learner in a highly personalised, on-demand fashion.

WBT-Master supports the following knowledge transfer processes:

- Web Based Training
- Web Based Tutoring
- Web Based Mentoring
- Web Based Knowledge Mining
- Web Based Knowledge Delivery
- Web Based Collaborative Problem Solving
- Gathering and Integration of Personal Knowledge
- Knowledge Profiling

Technologies used

Java servlet technologies.

Software Required to Run WBT-Master:

- Apache HTTP Server, version 1.3 or higher
- Tomcat Servlet Engine, version 3.2.1 or higher

Additional Information / Comments

It is available for free under the terms of the GNU General Public License.

9.4 Commercial Systems

9.4.1 IBM Lotus Learning Space

Description

Lotus LearningSpace brings new capabilities to e-learning, providing the most complete, Web-based learning system available. Lotus LearningSpace can be used to create an advanced environment for online learning, which helps organizations to achieve an unbeatable competitive advantage. Lotus LearningSpace 5 is built on the same proven, powerful Lotus LearningSpace platform, providing native support for self-paced, collaborative, and virtual classroom learning. It helps in incorporating content from almost any source and provides comprehensive tracking and reporting capabilities.

References

<http://www.lotus.com/products/learnspace.nsf/wdocs/homepage?opendocument>

9.4.2 Docent

Description

Docent offers a suite of learning management systems, course assembly tools, and other enterprise-level software for creating, deploying, and managing training over the Internet, intranets, or extranets. The Company's strategy is to offer a complete

solution for enhancing customer education and customer interaction through sales, service, and support organizations targeting. With its Docent Enterprise 4.0, the Company provides a framework for companies to design and deliver seamlessly integrated courseware along with results measurement and integration into other enterprise applications. Enterprise 4.0 allows students to register, manage their personal learning plans, and track their progress without third party intervention while allowing managers to administer courses, track and assess student needs, and monitor performance.

References

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

Additional information

Docent and Click2Learn have announced a merger, to be effective in the first quarter of 2004

9.4.3 Smartforce

Description

SmartForce is probably one of the world's largest and most experienced e-Learning company, (figures) provides learning solutions that help enterprises achieve tangible business results, such as driving revenues, increasing efficiencies and reducing costs, in concrete, measurable ways. It offers access to an online learning community that combines integrated e-Learning activities with 24-hour expertise and support. Content is personalized to suit learner's needs.

SmartForce Content is a collection of more than 20,000 learning objects available in more than 25 different learning formats such as an interactive course, a seminar or a white paper. Each of these objects is a self-contained block of learning that fulfils a single learning objective. The learning objects are arranged together in a learning path to achieve a specific instructional purpose. Instructional design methodology focuses on a four-pronged approach to content -instruction, collaboration, practise, and assessment- that harnesses the power of the Internet to create an interactive, personalized learning environment.

References:

<http://www.vcu.edu/cte/smartforce/>

9.4.4 Blackboard

Description

Blackboard 5SM is a e-Learning software platform that delivers a course management system, customisable institution-wide portals, online communities, and an architecture that allows for Web-based integration of multiple administrative systems.

Level One: Course Manager: Level One of Blackboard 5 delivers the course management system tools that enable instructors to provide their students with course materials, discussion boards, virtual chat, online assessments, and a dedicated academic resource centre on the Web.

Level Two: Course & Portal Manager: Level Two of Blackboard 5 expands beyond the Course Manager, and provides customized institution-wide portals for faculty, students, staff, and alumni with access to more than 150 personalized news and

information services from across the Web. The platform can be customized with institutional branding and a tailored look and feel. It enables institutions to develop online communities, Web-based email, calendar, announcements and tasks. It also allows for a central access point to all of your institution's online services.

Level Three: Advanced Course & Portal Manager: Level Three represents an end-to-end e-Learning solution. In addition to the Course and Portal Manager, Level Three provides advanced Java-based APIs for unifying diverse online campus systems into one integrated platform allowing for user-driven single log-in service delivery, as well as capabilities that allow each school, department or campus within the institution to maintain its own customized environment.

References

<http://www.blackboard.com/>

9.4.5 LearnLinc

Description

LearnLinc is developed by Mentergy, a company that provides e-Learning services, e.g. e-Learning Strategic Consulting, Custom Courseware Development, Authoring and Design Tools, and tools for delivering instructor-led training sessions. LearnLinc offers a live e-Learning environment via the Internet, intranet, or WAN, where instructors can synchronize many types of content while communicating with IP audio, text chat and streaming video. Applications Sharing provides a learning lab for software skills training while student progress is verified using continuous feedback, polling and comprehensive test via TestLincTM.

References

http://www.allencomm.com/products/live_elearning/learnlinc/
www.mentergy.com (Mentergy)

9.4.6 Edusystem

Description

EduSystem is an integrated environment for Internet-based distance education. It was developed by MT-System Ltd, a private system integrator enterprise belonging to Muszertechnika Holding with the primary objective to possess a strong competitive position in the domestic system integration and consultation market, with the support of the Hungarian National Research Fund. EduSystem covers the following learning processes: communication of new information, online consultations, group working, tracking of students' activity, self- and tutor controlled tests and online exam sessions.

References

http://www.argus.pt/sistemaedu_en.htm

9.4.7 Saba

Description

Saba Learning, Enterprise Edition TM is an Internet-based learning management system (LMS) that empowers the organization to manage and deliver learning courses to the extended enterprise of customers, partners and employees. Saba Learning,

Enterprise Edition TM is an Internet-based learning management system (LMS) that empowers an organization to manage and deliver all forms of learning to extended enterprise of customers, partners and employees.

References

http://www.saba.com/english/products/learning_enterprise/

http://www.deakin.edu.au/lms_evaluation/old/SabaLearning_ee.pdf

9.4.8 Click2learn

Description

Click2learn.com (formerly Asymetrix Learning Systems) provides off-the-shelf and customized software applications and services to create, deploy, and manage Internet-based training. In addition to its e-learning technology business, Click2learn.com is establishing a learning portal to aggregate and distribute content in the areas of IT and soft skills training to industry professionals, corporate intranets, Web portals, consumers, students, and higher education institutions. The Company offers its products on a subscription basis through its Web site and also sells third-party CD-ROM, video, audio, and print educational materials. For larger organizations, the Company creates a custom version of the portal designed to meet the specific needs of the corporate customer. The content is delivered through an open standard ASP model, completed with sophisticated learning management features and functionality that allows organizations to assign courses and track users' progress and test scores.

Click2learn offers the following two products for e-learning:

- Aspen Learning Platform
- Tool Book

References

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

Additional information

Docent and Click2Learn have announced a merger, to be effective in the first quarter of 2004

9.4.9 DigitalThink

Description:

DigitalThink develops and delivers Web-based IT training courses for programmers, software developers, system administrators, technical engineers, and end users in the technology, financial services, healthcare, telecommunications, and retail industries. Course topics include Windows NT Certification, programming (Java, C, C++, Perl), Internet literacy (Web design, Web programming, and publishing), Graphics (Photoshop, Illustrator, PageMaker), Linux/UNIX System and Network Administration, Oracle, MS Office applications, and databases. The course library comprises over 160 titles, all of which are tutored and mentored by live instructors. By adding several sales, HR, management, and investments training courses, DigitalThink recently expanded into the soft skills arena. DigitalThink also provides custom course development and management services for courses that can be co-marketed with client companies.

The DigitalThink E-Learning Platform has four basic components:

- DigitalThink Learning Environment
- DigitalThink Learning Management
- DigitalThink Reporting & Analysis
- DigitalThink Enterprise Gateway

References

<http://www.digitalthink.com/>

9.4.10 Additional Learning Vendors

The following is a non-exhaustive list of additional e-learning tools. These tools were not reviewed for the purposes of the present market analysis. Each tool is accompanied by a brief description.

9.4.10.1 WebCT

WebCT is a tool that facilitates the creation of sophisticated World Wide Web-based educational environments. It does this in three ways:

- It provides an interface allowing the design of the presentation of the course (colour schemes, layout, etc.)
- It provides a set of educational tools to facilitate learning, communication and collaboration.
- It provides a set of administrative tools to assist the instructor in the process of management and continuous improvement of the course.

WebCT is a tool built by instructors for instructors. It was built by educators at the University of British Columbia as a tool to allow other educators to build sophisticated Web-based learning environments without a lot of time, resources or technical expertise. The project lead, Murray Goldberg, won the university teaching prize in the first year as a faculty member at UBC and has published in the area of the educational effectiveness and student acceptance of web-based learning resources both in a distance learning setting and as a supplement to lecture-based courses. Still, WebCT is pedagogically neutral. Its goal is to provide a set of tools useful for a broad range of teaching methodologies, yet make it easy to experiment with new techniques.

References:

www.webct.com/

9.4.10.2 TopClass

TopClass courses are constructed of Units of Learning Material (ULMs). These ULMs can consist of pages, exercises, or further ULMs themselves. ULMs can be freely exported and imported from course to course. In addition to course management, TopClass also manages student progress, tracking, and access to course materials.

The learner tools in TopClass include web browsing and embedding of hyperlinks into documents. Asynchronous communication and sharing is supported through e-mail, threaded discussion groups and BBS file exchange. Synchronous tools are not supported. There is a self-testing facility and both tutor and student alike can track progress on coursework. It is also possible to produce individualized work plans for students.

References:

www.wbtsystems.com/

9.4.11 Microsoft Class Server

Description

Microsoft® Class Server 3.0 makes it easy for school districts to create, deliver, and grade standards-aligned tests and lessons over the Web—helping teachers track and improve student achievement against local curriculum standards, and meet the challenges of No Child Left Behind.

References

<http://www.microsoft.com/education/?ID=eLearning>

9.5 Other components

9.5.1 Synergeia (ITCOLE project)

Description

Platform and domain-independent support for collaborative knowledge building.

<http://bscl.fit.fraunhofer.de/>

The BSCL system has been developed within the ITCOLE project funded by the European Commission under the IST Programme. The software developed within the ITCOLE project is called the Synergeia system and will be made available to the public at the end of the ITCOLE project. The Synergeia System is not Free Software (Open Source), but it can be used free of charge at a computer run by FIT.

Technologies used

Synergeia represents an extension of the BSCW system. (Based on the Python technology).

Additional Information / Comments

References:

Internet-Based Learning and Collaboration for Dispersed Co-Workers

http://www.ercim.org/publication/Ercim_News/enw54/tan.html

9.5.2 aLF (active Learning Framework)

Description

aLF is a platform that has been developed at UNED in order to support the requirements for collaborative work. It is built upon the ArsDigita Community System, a multiplatform and open source set of tools for constructing web-based applications

Technologies used

It is built upon the ArsDigita Community System.

It is made up of a web server connected to a relational database and a set of TCL (Tool Command Language) scripts allowing management of the interaction with the data model.

9.5.3 Edubox

Description

<http://www.edubox.nl/>

Edubox is a flexible platform developed at the Open University of Nederland. The basis for this flexibility is EML (Education Modelling Language). EML provides the tool to developers to convert their educational and didactical ideas and views to digital learning materials. Learning materials and activities are coded in EML. Practically, Edubox provides a complete electronic environment that assists guides and supports management, authors, teachers and students, in educational, didactical and management aspects.

Alphanet relies on the technology / system EML Toolbox that is being developed at the Open University of Nederland (<http://www.edubox.nl/>).

Reusability: Limited

The component Edubox which would appear as a good candidate for reuse do not seems to be available outside the Open University of Nederland. The standard EML (Educational Modelling Language) supported, has been submitted to IMS as a standard, and can be considered for reuse.

9.5.4 VALA (U.S. Department of Education)

Description

VALA

Virtual Adaptive Learning Architecture Project

<http://www.vala.arizona.edu/>

VALA focuses on developing a learning architecture with user interface adaptability that provides a personalized learning environment for each learner. VALA's design allows easy customizing, while allowing for future expansion. VALA represents an example of an instructional environment where instructors from multiple disciplines can easily find, develop, edit and publish multimedia content in support of their instructional endeavours. The capabilities of VALA enable instructors to formulate research questions regarding the delivery of a learning experience and how it affects the learning outcome.

Technologies used

Apache Web Server with JServ running servlets & ORACLE JDBC Thin Client drivers.

Additional information

This system does not seem to be active anymore.

9.5.5 Macromedia's Learning Object Development Site

Abstract

Learning Objects Development Centre

<http://www.macromedia.com/resources/elearning/objects/>

Description

Macromedia's Learning Objects Development Centre helps users to download free white papers and sample applications to help in creating personalized, relevant learning experiences.

Technology Used

Macromedia Flash.

9.5.6 Synchronous components

Ants system

University of Murcia. ITCOLE project.

<http://ants.dif.um.es/cscl/>

The ANTS infrastructure defines a distributed architecture that enables development of new synchronous components on top of asynchronous workspaces.

ANTS

ANTS.CORE is a component framework that allows developers to easily create collaborative applications in the Java language.

<http://ants.etse.urv.es/>

Contents. 1 Introduction 1.1 The state of the art in Knowledge Sharing . . . 1.2 Challenges of distributed collaborative knowledge sharing . . . 1.2.1 What to share . . . Knowledge sharing is also the key power of the de-. D4.4 Distributed Collaborative Knowledge Sharing Framework. 7. OPAALS Project (Contract n0 IST-034824).Â€ Analyze the environment of sharing knowledge and propose new platforms of sharing distributed knowledge for digital ecosystems: community networks, organization net-works and digital ecosystem networks. The networks can be virtual networks. The sharing platforms can integrate all digital resource for knowledge sharing. The ability to efficiently deliver a drug to a tumor site is dependent on a wide range of physiologically imposed design constraints. Nanotechnology provides the possibility of creating delivery vehicles where these design constraints can be decoupled, allowing new approaches for reducing the unwanted side effects of systemic delivery, increasing targeting efficiency and efficacy. Here we review the design strategies of the two FDA-approved antibody-drug conjugates (Brentuximab vedotin andÂ€| CONTINUE READING. View on PubMed.