4 section four

The Role of Open Source Software, Open Standards, Open Content and E-Learning Standards in E-Learning

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E-learning has become pervasive. Schools, universities, government bodies and major economic organisations benefit from the advances made in e-learning research and its application. However, in order to further e-learning research, it is necessary to maintain an "open" culture. Universities and research centres dealing with research areas in e-learning adapt and use a range of tools, contents and systems that are "open". This paper gives a broad overview of the range of such tools, contents, systems and standards that help to popularise e-learning. It is the view of the author that future advances in e-learning can be made only when the content, the tools, the systems and the standards are made "open" for more people to use.

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1 Introduction

E-learning, the use of technology, especially the Internet, in teaching, learning and training, has become accepted all over the world.

It has become more pervasive especially after the SARS (Severe Acute Respiratory Syndrome) epidemic in Asia in 2003 which forces students to stay away from schools. Schools, universities, governments, companies all over the world realise that they need to build up their e-learning capabilities. As knowledge gets obsolete much faster than before the need to constantly learn to upgrade our skills becomes important. In addition, according to "The Horizon Report, 2007" [1], the environment of higher education is changing rapidly. Costs are rising and budgets are shrinking, and the demand for the new services is growing.

What about the future as we move forward from here?

When we trace back the background of e-learning, especially from the early days of using mainframe computers to provide computer-based training in the early 1960s and 1970s to the present when we are using the Internet to provide mobile learning, we can see that each transition happens when there is a paradigm change. For example, in the 1980s when CD-ROMs become popularly used all over the world, many people develop their e-learning contents and place them on CD-ROMs. In the same way, when the use of the Internet becomes widespread in mid 1990s, people start to deliver e-learning courses over the Internet [2]. As we move forward, it is the view of the author that the future e-learning model will be based more on Open Source Software, Open Standards, Open Content and E-learning Standards.
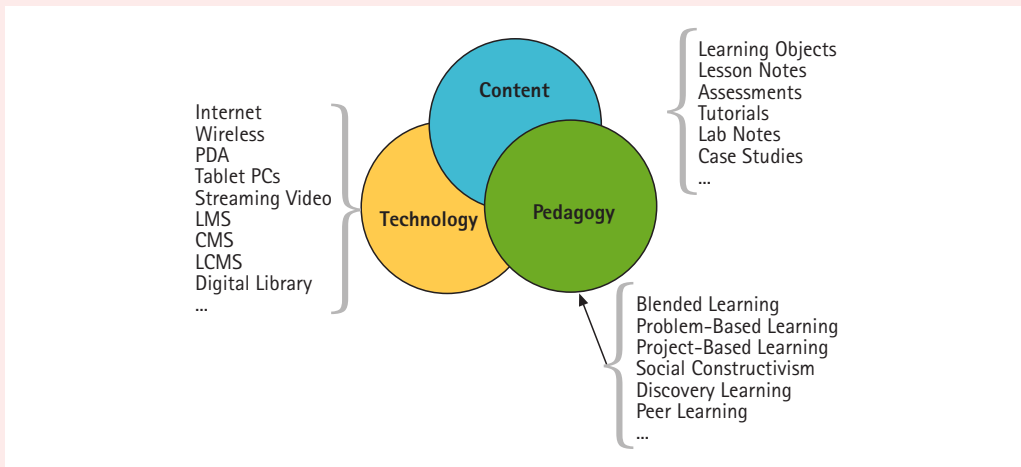

Figure 1: Components of E-learning

2   Open Source Software for E-learning

2.1   Definition

According to the Open Source Initiative's website [3], a particular software can be called open source software provided it has the following characteristics:

- Free Redistribution;
- Source Code;
- Derived Works;
- Integrity of The Author's Source Code;
- No Discrimination Against Persons or Groups;
- No Discrimination Against Fields of Endeavour;
- Distribution of License;
- License Must Not Be Specific to a Product;
- License Must Not Restrict Other Software; and
- License Must Be Technology-Neutral.

2.2   Examples

There are many open source software used in e-learning. These can range from the HTML editor to the learning management system. Generally, open source software provide the software tools, the systems, the editors, the conformance test tools and the delivery systems to deliver the content to the learner.

Perhaps one of the most useful sites where one can obtain open source software on e-learning is the Eduforge website [4]. Eduforge is the central point for the development, distribution and maintenance of free software for education. Table 1 provides some examples of open source software developed specially for e-learning. This list is not meant to be exhaustive but rather it gives an indication of the range of Open Source Software dedicated for e-learning.

CATEGORY	OSS EXAMPLE
LMS	Moodle, ILIAS, ATutor, Claroline, Docebo, OLAT
LCMS	Fedora (not the Linux version from Red Hat), DOOR (Digital Open Object Repository)
CMS	Plone, Joomla!
Tools	Xerte (XML Editor and Run-Time Editor), eXe (eLearning XHTML editor), RELOAD (Reusable E-Learning Object Authoring and Delivery), Pachyderm
Learning Environment (Computer Supported Collaborative Learning)	FLE3 (Future Learning Environment)
Assessment	APIS (Assessment Provision through Interoperable Segments) - based on IMS QTIv2 specification

Table 1: Some Open Source Software for E-Learning Standards Work

Figure 2 shows a screen shot of the DOOR (Digital Open Object Repository) Project. This project was started as an initiative of the eLab in Lugano, Switzerland but is now an open source project. DOOR is an Open Source software for creating learning objects repositories. With DOOR one can store digital content in the form of learning objects (LO), i.e. content + metadata, in a tree-shape catalogue. Once stored, the LOs can be searched, retrieved and included in courses or instructional units to be delivered to students.DOOR implements the IMS Metadata version 1.2.1 and Content Package version 1.1.3 specifications. It integrates fully with Moodle, an Open Source based LMS. The DOOR-Moodle plug-in allows Moodle teachers to browse more repositories seamlessly from a single Moodle course, and then select and import LOs with their metadata.

There are several organisations which are set up to do development and applied research work on e-learning tools and systems. A particular organisation which has been doing much useful work on Open Source Software for e-Learning standards work is the JISC Centre for Educational Technology Interoperability Standards (JISC CETIS) [5]. (JISC is the Joint Information Systems Committee of UK). This centre is managed by the CETIS at The University

of Bolton and partnered by the University of Strathclyde, Heriot-Watt University and The Centre for Recording Achievement in the UK. For example, it has a website devoted entirely on assessment tools, projects and resources, many of which are based on Open Source Software.

Source: http://sourceforge.net/projects/door/

3   Open Standards for E-learning

3.1   Background

The term "Open Standards" has two aspects [6]:

- The information is publicly available.
- It has various rights to use associated with it.

There are many meanings associated with the usage of the term "open" and "standard". The term "open" is sometimes restricted to royalty-free technologies. The term "standard" is sometimes restricted to technologies approved by formalised committees such as the ITU, ISO or the IEC. Participation in such international organisations is open to all interested parties and these organisations operate on a consensus basis.

Some definitions of the term "open standard" permit patent holders to impose "reasonable and non-discriminatory" (RAND) royalty fees and other licensing terms on implementers and/or users of the standard. However, permitting such fees is controversial. Many definitions of the term "open standard" specifically forbid any such fees.

The term "open standard" is sometimes coupled with "open source" with the idea that a standard is not truly open if it does not have a complete free/open source implementation available. As such, very often, one comes across terms like FOSS (Free and Open Source Software) and FLOSS (Free/ Libre/ Open Source Software) as equivalent to "open standards".

Open standards which specify formats are sometimes referred to as open formats. Many specifications that are sometimes referred to as standards are proprietary and only available under restrictive contract terms (if they can be obtained at all) from the organisation that owns the copyright on the specification. As such these specifications are not considered to be Open.

3.2   Relating Open Standards to E-learning

Open standards are desirable but they will not solve all the ills in e-learning.

There may be tensions between open standards development, user-focused development, innovative development and long-term preservation. For example: podcasting is not based on open standards (it is RSS - Really Simple Syndication) so some standards which are very valuable may not be ratified by any committee at all. Equally, PDF is an international standard (ISO 19005-1) but is it also a proprietary product (it is owned by Adobe).

Universities and research centres are always keen to embrace and use open standards. Hence it is important for us to cultivate an open standards culture in e-learning.

4   Open Content for E-learning

4.1   Background

Open content describes any kind of creative work (including articles, pictures, audio and video) or engineering work (e.g. open machine design) that is published in a format that allows anyone to copy and modify the information. This need not be done exclusively by a closed organisation, firm or individual.

Technically, it is royalty free, share alike and may or may not allow commercial redistribution. Content can be either in the public domain or under an open license like the Creative Commons licenses [7].

The words "open content" were perhaps first put together by David Wiley, then a graduate student at Brigham Young University. He founded the OpenContent project and put together the first content-specific (non-software) license in 1998.

Some open content materials can be described as free content, although technically they describe different things. For example, the Open Directory Project [8] is open content but is not free content. The main difference between the licenses is the definition of freedom. Some licenses attempt to maximise the freedom of all potential recipients in the future while others maximise the freedom of the initial recipient. Much of the ideals of the open source movement were led by the Massachusetts Institute of Technology (MIT). One such application is their Open Courseware [9].

With the increased interest in open content, many universities have started offering online video/audio courses to the general public, such as the Tele-Teaching Solution Kit [10]. This has resulted in a great increase in open content providers and open content search engines.

4.2 Examples

The following are some well-known examples of open content repositories:

- Wikipedia - a multi-lingual, web-based, free content encyclopedia project. Wikipedia is written collaboratively by volunteers. The majority of its articles can be edited by anyone with access to the Internet [11].
- Connexions - a global open content project started by the Rice University [12].
- OER Commons - a network of open teaching and learning materials, with ratings and reviews [13] (OER - Open Educational Resources).
- OpenLearn - free and open educational resources from The Open University [14].
- MIT OpenCourseWare - This is a free and open educational resource (OER) for educators, students, and self-learners around the world.

Another example is the OpenLearn website (http://openlearn.open.ac.uk/) from the Open University of UK which gives free access to course materials from The Open University.

5   E-learning Standards for E-learning

Since the first sets of e-learning standards were released by the AICC (Aviation Industry CBT Committee) in 1988, we have seen many e-learning standards released by organisations such as the IMS Global Learning Consortium, the IEEE Learning Technology Standards Committee and the Advanced Distributed Learning Project of the US Department of Defense. Strictly speaking, these are not "standards" as used in the sense of the ISO/IEC standards. However, as the "standards" released by the AICC, the IMS, the ADL Group and the IEEE LTSC have become widely used, they are loosely termed as "standards".

Some of the major standards released by the above-mentioned organisations are:

- Labelling of the digital content (Metadata) - this makes digital content (usually in the form of learning objects) easy to find and use.
- Packaging of the content (Content Packaging) - this makes the content (in the form of a zipped file) easy to be imported into a standards-compliant e-learning system.
- Question and test items (Question and Test Interoperability) - this allows authors to code their assessment items in a standards-based text file and allow these to be reused in other standards-compliant assessment engine.
- Computer Managed Instruction - Communication with the backend system - this is an ECMAScript application-programming interface (API) for content-to-runtime-services communication [15].
- CMI Data Model - Data Model for communicating with the backend system, e.g. student name (cmi.core.student_name) and session time (cmi.core.session_time).

- XML Binding of Data Model - the purpose of this standard is to allow the creation of IEEE 1418.11.1-2004 data-model instances in XML. This standard uses the W3C XML Schema definition language as the encoding. It allows the interoperability and the exchange of data-model instances between various systems. (W3C - World Wide Web Consortium; XML - eXtensible Markup Language; IEEE - Institute of Electrical and Electronic Engineers).
- Sequencing and navigation of the learning contents (IMS Simple Sequencing) - This standard allows different learning paths to be specified so that learners can go through an e-learning course according to their learning pace.

6   Conclusion

Having reviewed areas on Open Source Software, Open Standards, Open Content and E-learning Standards, the author makes the following conclusions:

- There will be more and better variety of e-learning tools, contents and systems that will be based on open source software. For example, the DOOR Project [16] provides a smooth integration with the Moodle Learning Management System.
- Even though open source software is generally made available for free (as in without any charge), such e-learning tools, contents and systems are high-quality and standards-based. For example, the Xerte Project [17] and the eXe Project [18] provide free tools for creating rich, interactive e-learning content for the Flash platform.
- The success stories of Wikipedia has spurred several organisations to set up content repositories based on this open content model.
- More organisations, schools and universities are developing their e-learning contents in terms of "learning objects". Learning objects are now being developed for different domain areas such as for the American Sign Language, mobile learning for the US Coast Guard, employee training and competency development and even for teacher education [19].
- Open Source, Open Standards, Open Content and E-Learning Standards have all increased community sharing, collaboration and participation by the many more people. They have contributed to the growth and popularity of Web 2.0 applications such as Flickr, Facebook, MySpace and Google Earth.
- All these openness and standards have facilitated a new trend in which content does not remain static but is continually being reused and enriched through sharing and enhancement. One good example is the rich video contents available from the YouTube website. There are many video clips which are used for e-learning. E-learning is no longer just about having interactive content but also having content that can be discovered, enhanced and reused many times.

7   References

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