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Section Three

The Future of E-Learning Standards

The AICC (Aviation Industry CBT Committee) is formed in 1988. As such, we can roughly take 1988 to be the year in which e-learning standards started. The world thus have about 21 years of experiences with e-learning standards. Several major international e-learning specification organisations have also been set up. These include the IMS Global Learning Consortium, the Advanced Distributed Learning Initiative, the IEEE Learning Technology Standards Committee, the SC 36 Sub Committee of the ISO/IEC JTC 1 and the LETSI (Learning Education Training Systems Interoperability) organisation.

This article summarises some of the better known specifications and standards that have impacted the e-learning in general. The author will also deal with some of the assumptions made when these specifications are being drafted. What are the issues these e-learning specifications are trying to address? Will these issues be valid as we move into the 21st century? In addition, with the continuing use of new technology with our young people, what will become of the relationship between technology and pedagogy? Will e-learning standards still be relevant in future? If so, what will the standards be addressing that the current existing standards are not able to address? If the standards are not going to be relevant, how will our people cope with e-learning when pandemic (like the current Influenza A H1N1 virus) strikes the world?

This article takes a futuristic view of e-learning standards based on the successes and failures of e-learning standards.

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1 BACKGROUND

E-learning standards appear to have started with the formation of the AICC (Aviation Industry CBT Committee, http://aicc.org) in 1988. The AICC is an international association of technology-based training professionals. It develops guidelines for aviation industry in the development, delivery, and evaluation of CBT and related training technologies. Two of its objectives are on the development of guidelines which promote the economic and effective

implementation of computer-based training (CBT) media and the guidelines to enable interoperability. The most famous of these guidelines is the CMI-001 CMI Interoperability Guidelines which actually allows content to be specified on the learning management system (LMS) so that it can be the same content can be used on different LMSs.

Since then (starting around 1997) several specification organisations have been set up in Europe, Japan as well as in the USA. Among these are the IMS Global Learning Project, the IEEE Learning Technology Standards Committee (http://ieeeltsc.wordpress.com/), the ARIADNE Project in Europe, the PROMETEUS Project in Europe, the Advanced Learning Infrastructure Consortium (ALIC) of Japan, the Advanced Distributed Learning Project of the US Department of Defence and the SC36 Sub Committee (http://www.iso.org/iso/standards_development/technical_committees/list_of_iso_technical_committees/iso_technical_committee_participation.htm?commid=45392) of the ISO/IEC JTC 1. They helped to build up the community of practitioners on e-learning standards. Please see Figure 1 below.

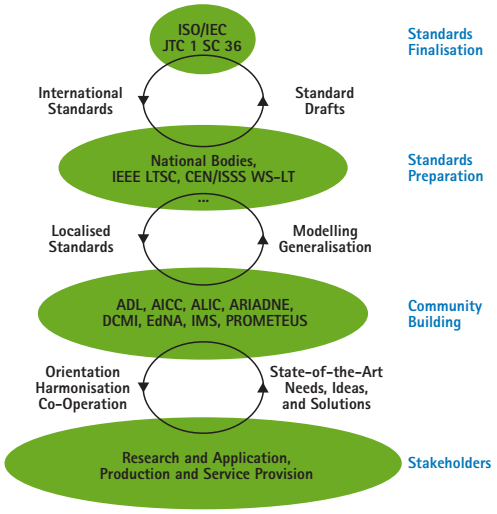

Figure 1: International e-learning organisations and their relationships

2 CURRENT E-LEARNING SPECIFICATIONS

One of the first specifications that these specification organisations worked on was that of metadata. The Dublin Core Metadata Element Set Specification (DCMES, http://dublincore.org/documents/dces/) is a much earlier specification that is released in 1995. It is used widely in the library world. Nevertheless, the IMS Global Learning Consortium (http://www.imsglobal.org) decided to develop and released Version 1.0 of their IMS Metadata Specification in August 1999.

At around the same time, the US Department of Defence started the Advanced Distributed Learning (ADL) Project (http://www.adlnet.gov). The SCORM Specification Project forms one of the six goals in this ADL Project. This goal is to come out with a set of development and implementation guidelines on e-learning. The ADL Project's focus lies on self-paced learning, without a real-life tutor, in pure computer-to-learner situations, any time and anywhere. This project has a special focus on the international SCORM standard, learning paths, and authoring issues.

Version 1.0 of the SCORM Specification was released sometime in 2000. Since then it has received considerable support from the various international e-learning companies such as Blackboard, Plateau, Lectora, Pathlore and Moodle.

Essentially, the ADL Project people work by not reinventing the wheel. They did not develop the various component specifications like metadata, content packaging and the capturing of e-learning user's computer interactions. The ADL Project people developed a framework which requires e-learning content to be granularised as learning objects. Then, in order to achieve the goals like reusability, accessibility, interoperability and durability (RAID), they co-opted the use of the IMS Metadata Specification, the IMS Content Packaging Specification and finally the AICC CMI-001 CMI Interoperability Guidelines (http://www.aicc.org/pages/down-docs-index.htm#cmi001). The three important areas that the early SCORM Specification 1.2 are the metadata, content packaging and the runtime environment. All these took place before the year 2004.

What is exciting is that the ADL Project actually developed the software and provide sample contents for developers to start using the SCORM 1.2 Specification. This represents a quantum leap for many e-learning companies, both the developer and the uses are now able to see how the SCORM 1.2 Specification really works in reality.

The e-learning community was excited and there was much excitement in using the SCORM 1.2 Spefication. Underpinning all these developments is the requirement that e-learning content has to be granularised as learning objects. This was also the period (between the years 2000 and 2004) that many people came out with their interpretations of learning objects. CISCO, the global networking company, developed their own internal approach to developing learning objects. NETg, another e-learning content developing company, also proposed their own unique approach to developing learning objects. Even Macromedia (now bought over by Adobe) have their own guidelines on what learning objects should be and how these can be developed using the popular Flash software.

Whichever model one chooses, it appears that all the learning object's definitions contain the following characteristics:

- A single learning objective.
- Meaning content to engage students within about 20 minutes.
- Practice questions for the learner.
- Assessment or evaluation of the learner's performance.
- Ability to package the contents as a zipped file.
- Descriptive labels to describe the nature of the learning object.

In addition to all these characteristics, the ADL Project people introduced the concept of a SCO - Sharable Content Object. With this SCO concept, the LMS is able to track the learning of the user. So, if a student bookmarks a certain web page, the LMS will keep this bookmark in its database. The data model element of **cmi.location** (cmi.core.lesson_location) - provides a free text field for the SCO to record a bookmark. If the SCO is bigger than just a couple HTML pages, it should consider implementing a bookmarking feature to let the learner resume a paused attempt.

Version 1.0 of the SCORM Specification was quickly replaced by Version 1.1 and then Version 1.2. It is the Version 1.2 of the SCORM Specification that has been accepted widely by the e-learning industry. This happened during the years from 2002-2004. Subsequently, the ADL Project people included the sequencing and navigation part to the specification and for the sequencing component, they adopted the IMS Simple Sequencing specification (http://www.imsglobal.org/simplesequencing/index.html). This IMS Simple Sequencing specification provides some content branching for learners with different learning capabilities. So, in an e-learning course, we can provide a few learning paths, such as "no sequencing", "linear sequencing", "competency-based", "knowledge-paced" and "remediation".

Unfortunately, the new sequencing and navigation part of the SCORM specification is difficult to understand and implement as well. As such, the take up rate has been very negligible, or even none at all. Although the ADL Project has released its 4th Edition, there is hardly any implementation of the SCORM 2004 specification.

Another development that is gaining much acceptance is the increasing use of open source software in implementing e-learning standards projects. However, using open source software does not guarantee interoperability, which is one of the aims of e-learning standards like the IMS Digital Repositories Interoperability (DRI) specification (http://www.imsglobal.org/digitalrepositories/index.html). A case in point is the Open Knowledge Initiative (OKI) Project from the MIT (http://www.okiproject.org). The OKI project is based on a range of open source e-learning service APIs (Application Programming Interfaces), including a digital repositories service. Unfortunately, both the IMS DRI specification and the OKI project were not compatible at all [1].

Ultimately, all e-learning standards or specifications aim to achieve at least one of the "-ilities" such as reusability, accessibility, interoperability, durability, adaptability and maintainability (http://www.learnilities.com.au/about.htm).

Figure 2 represents the author's forecast on the popularity of the e-learning standards over time. The use of e-learning standards can be said to peak around the year 2004. Subsequently, there is generally a decline on its usage worldwide. Some reasons can be attributed to factors like many people around the world are using e-learning not just for content learning but for collaborative, project-based, game and simulation learning as well. Some of these areas do not yet have any standards or specification associated with them. Another factor is that many corporations and education setups are resorting to deliver new e-learning contents via new technologies that do not have their corresponding e-learning standards. For example, we have new mobile 3G hand phones or smartbooks that can deliver rich Internet content. Thirdly, with these new technologies, people are also learning differently. Many people are always on the go and do not have the luxury of sitting for hours at one stretch just to do some reading. The pedagogical model will be different. Micro-learning (http://en.wikipedia.org/wiki/Microlearning) and micro-teaching might become fashionable in future.

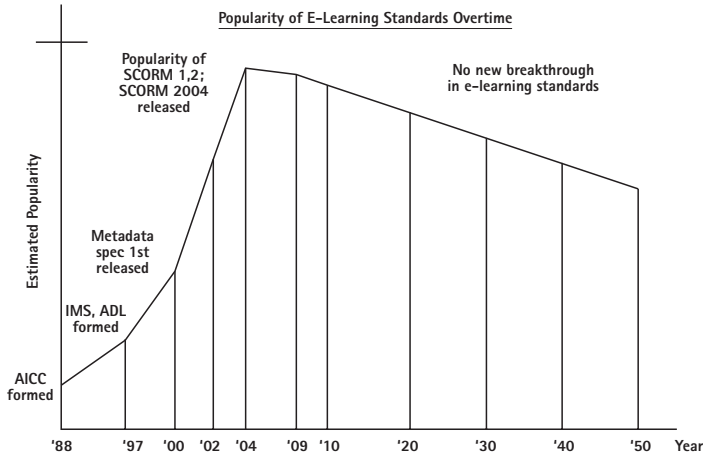

Figure 2: Estimated popularity of E-Learning Standards over time

3 THE FUTURE

Looking into the future of e-learning or e-learning standards is not easy. However, there are several possibilities.

The first possibility is that of the content aggregation. The author thinks that with more and better research done on e-learning content and pedagogy in general, there will be specifications that address the need to aggregate content according to the needs of the user. Where previously we have many different approaches to "chunking" content and design learning objects according to models like the CISCO or the NETg model, there will be specifications that allow the flexible aggregation of content. So, if an instructional designer wants to design content for 3G mobile hand phone delivery of e-learning, he or she can refer to a new flexible content aggregation specification.

Content aggregation also refers to the process in which the learning content or an assessment can be packaged up as a zip file. This zip file can then be imported or exported from a Learning Management System. The current widely used specification is the specification developed by the IMS Global Learning Consortium. This specification uses an XML manifest file called imsmanifest.xml wrapped up inside a zip file. The learning content itself is either included in the zip file if it is HTML or other media that can run on its own, or else is referenced as a URL from within the manifest.

The future content packaging specification goes beyond just the packaging for import and export purposes. It will also allow content to be aggregated according to the needs of the end-user.

The second possibility is the integration of knowledge management (KM) and e-learning.

KM is a branch of management. This makes it a social science. Moreover, it is a branch of management that seeks to improve business performance by enhancing an organisation's capacity to learn, innovate, and solve problems. The purpose of KM is to enhance knowledge processing.

KM is not information management, document management, data warehousing, data mining, imaging, yellow pages, content management, bulletin boards, ERM, CRM, BPM or any other form or application of information technology (IT). Nor is it library management, library science, business intelligence, best practices management, social network analysis, quality management, training, or e-learning.

All the e-learning standards organisations are doing now is to focus on the e-learning standards when the need for knowledge management is more vital to an organisation. Unfortunately, there are currently no widely accepted standards in KM. Nonetheless, the author believes that KM standards will gradually evolve from the work done in the e-learning standards world.

The third possibility is the extension of the current IMS QTI (Question and Test Interoperability) specification. In the future, researchers will be looking at ways in which learners go beyond just picking up knowledge from the topic. The future specification in this area will be combined with the sequencing and navigation specification to produce adaptive ongoing assessment. What this means is that the learner will be able to get ongoing questions that would have the level of student's difficulty.

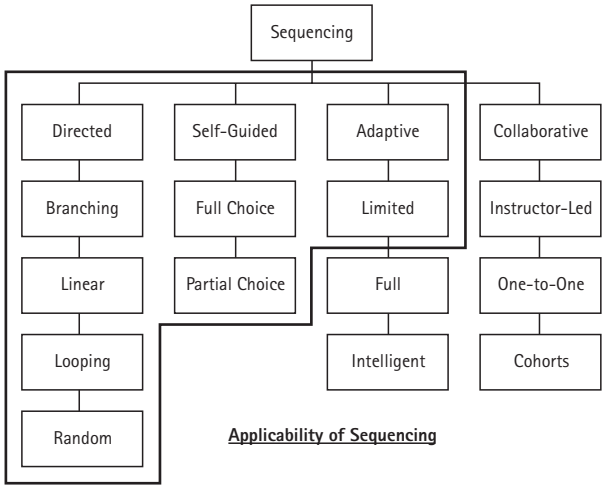

Figure 3: Pedagogical areas where content sequencing can be applied

The fourth possibility is in the area of collaborative (or cooperative) learning and assessment. Combining collaborative learning and assessment will enable teachers to make better use of technology to monitor and assess students' learning other than the usual single-user self-paced learning environments. Although there are some systems available to allow teachers to track students' learning in areas like project-based learning, there are currently no standards that apply specifically to group and individual learning via collaborative efforts. The roles of participants in collaborative learning should be clearly defined under the new context of e-learning. Moreover, educational quality, values and effectiveness of various learning activities supported by technologies in e-learning, can be specified.

The fifth possibility is in content tracking. Content in future can be structured quickly and flexibly. So, in one learning environment, e.g. a game, content can be a SCO (Sharable Content Object) and in another learning environment, this game SCO can be exchanging the score data with another simulation SCO. The current AICC-based data model can still be used but there will be enhancements and extensions that allow designers to add in their game or simulation data model elements.

The sixth area is in the area of combining eBook specification with mobile learning. The organisation that is currently driving the development of the Open Publishing Structure (OPS) is the International Digital Publishing Forum (IDPF). Moving forward, we see a high possibility of the merging of specifications in both the eBook specification and that of e-learning content delivery over mobile devices - commonly referred to as m-Learning. M-learning is convenient in the sense that it is accessible from virtually anywhere. This provides access to all the different learning materials available. It is also collaborative. It supports portability as books and notes will be replaced by small RAMs (Random Access Memories) that will be filled with learning content.

The seventh possibility is in extending the application of current e-learning specification like the SCORM specification to areas like games, simulation and virtual reality. More specifically about learning applications, in a military context, Forterra (virtual world developer Forterra Systems Inc.) have embedded SCORM compliant e-learning into the virtual world. Content can be accessed by participants directly or assigned by instructors as well as attached to objects for contextualised learning. Please see Figure 4 below.

Figure 4: Using SCORM in a virtual world (green arrow indicates location of a SCO) [2]

The future e-learning standards will evolve slowly and rather incrementally. Essentially, the changes will take place in areas like moving away from a rigid content-centric and inflexible paradigm to a more dynamic and flexible paradigm that allows teachers to monitor collaborative or cooperative learning. Table 1 summarises the changes in the new paradigm.

Ultimately, e-learning standards should be transparent to the end-user learner. The learner does not need to know anything about the standards as he or she engages in e-learning.

S/No.	Existing Paradigm	New paradigm
1	Rigid content aggregation	Flexible content aggregation & packaging
2	Focusing only on e-learning	Expanding scope to cover Knowledge Management
3	Focusing on just the topic assessment using Question & Test Interoperability (QTI) specification	Linking Question & Test Interoperability with sequencing and navigation
4	Single-user, self-paced & content-centric learning	Collaborative (or cooperative) learning
5	Content tracking	Dynamic content tracking and exchange of learning data
6	Focusing more on the format (e.g. eBook)	More functionality (e.g. adjustable screen layout) for mobile learning, or mLearning
7	Getting the learner engaged	Assessing the learner on his or her learning capability whilst making it very engaging via games, simulation and virtual reality

Table 1: Changes in the new paradigm

4 REFERENCES

[1] Dalziel, James (2003). Open Standards versus open source in e-learning. Retrieved 28 July 2009. - http://www.melcoe.mq.edu.au/documents/OpenStandardspaper.doc

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Mr Lim Kin Chew is a Senior Lecturer cum Research Fellow in the SIM University in Singapore. He has a B.Sc (Physics), Dip-Ed and an M.Sc (Business Systems Analysis & Design). Currently he looks after the Executive Graduate Diploma and Executive Master Programme on Open Source Software Management in the SIM University. His research work is on e-learning standards. Since 2003, he has been the Chairman of Singapore's Learning Standards Technical Committee (LSTC). LSTC is one of the 12 technical committees set up by the IT Standards Committee of Singapore (http://www.itsc.org.sg). Through this committee, he and his committee members have introduced nine Singapore Standards on e-learning, some of which are used widely in the Singapore schools. He has previously organised two Plugfests where e-learning vendors tested their contents and systems for interoperability.