IMPLICATIONS OF LEARNING TECHNOLOGY STANDARDIZATION IN ELECTRONIC DESIGN

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Abstract: The e-learning domain is involved in a deep standardization process. Several topics related to e-learning authoring, delivering, and management are being discussed to obtain general accepted recommendations. This panel will discuss the main standardization activities from a general perspective but also will analyse its implications in a specific field: the electronic design.

Key words: E-learning systems; standardization; electronic design; CAD; semiconductor industry.

1. INTRODUCTION

Advances in information and communication technologies, and specially in Multimedia, Networking and Software Engineering allow the apparition of a new generation of computer-based training systems. Internet is today the ubiquitous supporting environment for virtual and distributed learning environments. As a consequence, many institutions, both public and private, take advantage of new technologies to offer training products and services at all levels.

In this situation, educational systems and resources proliferate, and a need for standardization becomes apparent. Like in other standard-driven initiatives, standardization applied to learning technologies will enable reuse and interoperation among heterogeneous software systems. To achieve this, a consensus is needed on architectures, services, protocols, data models and open interfaces.

Thus, institutional users of educational software are joining their efforts to achieve standards and recommendations to support the interoperation of heterogeneous learning systems. This is an active, continuously evolving process that will last for years to come, until a clear, precise and generally accepted set of standards for educational-related systems is developed. This is a complex process, which occurs at several levels and is supported by many different related initiatives.

2. SOME LT STANDARDIZATION ACTIVITIES

A basic aspect subject to standardization is educational content organization, that is, data models to describe static and dynamic course structure. Static course structure defines the *a priori* relations among course contents (lessons, sections, exercises, etc.), whereas course dynamics determines the particular vision that users have depending on their attributes and previous interactions. To be able to implement both static course organization and dynamic behavior as defined by course developers, a clear and precise definition of the supporting data models is needed.

Going a step further, more elaborated learning designs can be specified using EMLs. An Educational Modelling Language (EML) is a semantic notation to create units of learning to support the reuse of pedagogical entities like learning designs, learning objectives, learning activities, etc. They are used to create highly-structured course material. An EML-based course might offer features such as: re-useable course material, personalised interaction for individual students, media independence, etc.

As common agreements on course structure and design enables the migration of educational contents to different software platforms, data models on final users will facilitate the sharing of student records and other personal information among educational institutions. An agreement is needed on contents (i.e. which information should be provided) and formats. Student data include static information, like name and affiliation, and dynamic information generated as a result of their interaction with educational resources, like grades or completed courses.

In fact, student evaluation and grading is also subject to standardization. Some recommendations about testing and grading are already available. They define taxonomies and vocabularies to be used to de.ne tests. The corresponding data models define aspects ranging from question formatting to evaluation and assessment criteria.

A key aspect in networked educational systems is to define, as precisely as possible, the services offered to potential users. Information on offered courses, related contents, target audience or technical requirements should

be made available in a way that permits searching, location and, eventually, access. The trend is to describe this information using metadata. Metadata recommendations for educational systems are one of the most productive activities in the standardization of computer-based learning systems.

Besides commonly accepted data models, an agreement is needed on course encapsulation to facilitate course transfer among institutions. Packaging models define how to encapsulate all elements belonging to a course (educational contents, organizational information, metadata, etc.) in a single entity to be easily transferred from system to system.

To permit content reuse, course contents should be clearly separated from the runtime environment. Runtime environments deliver educational contents, supervise student interaction with contents, and decide the next content to be delivered depending on course statics and dynamics, and previous student interactions. Institutions involved in this standardization process recommend that all logic needed for the runtime environment should be implemented independently from the logic used to define, handle or store educational contents. For this, clear open interfaces are needed. This is another field where standardization efforts have been remarkable.

There are also some proposals identifying common software components and their interfaces for distributed educational systems. As in the case of runtime environments, these components should offer open interfaces to permit peers in other institutions to locate and access offered services. A general agreement on interfaces for distributed systems will permit software and content reuse and interoperability, and incremental distributed system design.

Additional standardization fields include: accessibility, collaboration, glossary and vocabulary, intellectual property and digital rights, localization and internationalization, competency definitions, user interfaces, platform and media or quality standards.

The e-learning standardization process was initiated by several unrelated groups to arrange formats for data interchange. Nowadays, the standardization is mainly driven by a few bodies (c.f. Table 1). These institutions and other organizations and bodies that also participate in this process have a close relationship among them and collaboration is very common. Involved actor include official standardization bodies, massive consumers of learning objects and educational software and other consortiums of both public and private institutions, including individuals, that are interested in the promotion of learning objects and software reuse and interoperation.

Table 1. Main learning standardization bodies

Acronym	Initiative	URL
DoD ADL	US Department of Defense Advanced Distributed Learning	http://www.adlnet.org
AICC	Aviation Industry CBT Committee	http://www.aicc.org
CEN/ISSS/LT	European Committee for Standardization / Information Society Standardization System / Learning Technologies Workshop	http://www.cenorm.be/sh/lt
IEEE LTSC	IEEE Learning Technologies Standardization Committee	http://ltsc.ieee.org
IMS	IMS Project &Consortium	http://www.imsproject.org
ISO/IEC JTC12 SC36	ISO/IEC Joint Committee for the Standardization of Learning Technologies	http://www.jtc1sc36.org

3. THE PANEL

This panel will present LT standardization activities both in Europe and at a world-wide context. For this special attention will be given to specific needs of the electronic design area. Two experts in this field will participate and offer the perspective of learning objects and educational software consumers: Mr. Martin Curley, director of IT Innovation at Intel Corporation, who will bring the needs from the semiconductor industry and Mr. Ricardo Reis, IFIP vice president and professor at the *Universidade Federal do Rio Grande do Sul,* Brazil.

Expertise on LT standardization will be provided by Mr. Frans van Assche, from the European SchoolNet and current vice-chair of CEN/ISSS Workshop on Learning Technologies, and Mr. Rolf Lindner, from the Darmstadt University of Technology, Germany, active member in several communities like CEN/ISSS WS on Learning Technologies and the corresponding group in ISO (ISO/JTC1/SC36).

As a result of the panel discussion we will answer the following questions: Is there a real need for LT standardization in the electronic design domain? Is there any specific need in electronic design different from other areas as far as LT standardization is concerned? Can these needs be overcome with the current outcomes from the LT standardization process? Do we need to open new standardization work to cover specific needs for education in electronic design?