DISTANCE EDUCATION – A BATTLEFIELD FOR STANDARDS

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Introduction

Distance Education (DE) has been evolving over the last three decades, starting from mainframe based learning systems, bulletin boards, CBT systems, authoring systems, to web-based learning platforms and Learning Management Systems.

A key factor of Distance Education in combination with the Internet is the possibility to learn anywhere and anytime. On the one hand learners want to find content as easy as possible, they want to incorporate it into their courses and they want to move between institutions taking their learning bulletin with them [5]. But most times learning environments and especially learning materials were developed individually. Thereby many excellent learning materials are underused or were developed not only once, but again and again and again. The reasons for these redevelopments are manifold, e.g. proprietary formats, lack of interoperability or simply because nobody knew that they exist.

The demands mentioned can only be guaranteed by products (learning material, learning environments, etc.) that adhere to standards. On the other hand companies and product developers want to increase the return of investments, to eliminate redundant developments and to deliver learning material across multiple media (online, CD-ROM, print, etc.). "As organizations make significant investments in digital learning content, there is a strong desire to have greater assurances, portability, and re-usability. As organizations focus on providing learners with the "just right" content and activities, there is a strong desire to have the ability to more easily store, search, index, deploy, assemble and revise content. All of these hopes are part of the story of "learning standards" [15]".

Expectations in Distance Education Standards

It is agreed that standards are needed. We can find standards everywhere in our daily life: Electricity, telephones, cars, etc. are all examples of systems based on standards. Also in Distance Education standards are relevant for various reasons. Svensson [16] points out four major advantages of standard development and use in DE:

- "Durability – no need for modification as versions of system software change.

- Interoperability – operability across a wide variety of hardware, operating systems, web browsers and learning Management Systems.

- Accessibility – indexing and tracking on demand.

- Reusability – possible modification and use by many different development tools."

The most obvious benefit of standards in DE (especially when talking about metadata standards) is that learning material can be found much easier. Because of this content-openness the quality and breath of learning materials get enhanced.

The use of standards also ensures that content can be reused easily. In DE the reusability of learning material is essential, as the development is very cost-intensive and time-consuming. In order to avoid stranded investments, it is necessary to use standards and that the learning material itself must not be structured rigidly. There is also a need to organise it as flexible as possible. Nowadays, this flexibility is most often not given; also therefore nearly the same learning material has to be developed several times. E.g. parts of a course in object-oriented programming could be reused in special programming courses like C++, JAVA, C# and can be adaptable to other target groups as well (e.g. a beginners

course in computer science, in schools, etc.). The example shows that learning material gets not only flexible by using standards, but could also be re-purposed. So standards and specifications facilitate interoperability, exchange and dynamic content delivery.

Another advantage is that the quality of course material also improves. When there are standards for organization, format, indexing, etc. of resources, experts can concentrate to work in the area of their core competence.

From the didactical point of view standards in DE are needed as well. In this area standards provide opportunities to construct and offer individual learning models [17]. They meet diverse learning needs and learning styles, support a number of different pedagogies and allow customized learning-models.

Finally, using standards in development also allows consistency across courseware. The increased interoperability and reusability allows developers to protect their investments. Also mass customization is possible when adhering to standards and in the end standards create a potentially global market for DE products developed domestically.

Today's Distance Education Specifications and Standards

Many organisations, consortiums, etc. are working in the area of DE standards. For instance organisations like the Dublin Core Metadata Initiative (DCMI) [7], Institute of Electronical and Electronic Engineering (IEEE) [11], IMS Global Learning Consortium (IMS) [13], Alliance of Remote Instructional Authoring and Distribution Networks for Europe (ARIADNE) [2], Aviation Industry CBT Committee (AICC) [3], Advanced Distributed Learning Initiative (ADL) [1], etc. have working groups in order to establish DE standards. This list could be easily continued. It is not possible to mention all organisations working in the area of DE. The following chapter provides a brief summery about today's approaches.

Organisations and their Distance Education Specifications and Standards

Dublin Core Metadata Initiative (DCMI): The Dublin Core (DC) standard for metadata can be regarded as the "grand father" of today's metadata specifications (e.g. IEEE´s LOM, IMS Learning Resource Metadata, …) or as the lowest common denominator. DC consists of 15 elements, which are all optional (none are mandatory) and syntax-independent. These elements are grouped to content, intellectual property and instantiation. DC suits well for archives or libraries, but for practical use within learning environments (assembling of content, searching for suiting courses) it is not convenient.

Institute of Electronical and Electronic Engineering (IEEE): The IEEE Computer Society Standards Acitivty Board chartered the Learning Technology Standards Committee (LTSC) in 1998 in order to develop accredited technical standards, recommended practices and guides for learning technology. LTSC consists of 9 groups working in different areas: General (Architecture and Reference Model, Glossary), Learner-Related (Competency Definition), Data and Metadata (Learning Objects Metadata, Semantics and Exchange Bindings, Data Interchange Protocols), Management Systems and Applications (Computer Managed Instructions, Platform and Media Profiles) and Digital Rights Expression Language. The metadata standard LOM (Learning Objects Metadata) [11] was developed in cooperation with ARIADNE and IMS and is built on metadata work done by Dublin Core. LOM maps the DC elements and adds several other elements. The last version of LOM is based on the former LOM standard (developed in cooperation with IMS and ARIADNE) and extended by LTSC. LOM was developed to allow interoperability and reusability. Its main aim is to have a classification that allows an easy way of searching, retrieving, using and evaluating learning objects. For each learning object a metadata file is added, which classifies the learning objects in LOM. But LOM does not specify a certain data format, protocol or a guideline for implementation. So it can be interpreted and implemented in many different ways, which is counterproductive to the aim of interoperability.

IMS Global Learning Consortium (IMS): IMS was funded in 1997 by the members of EDUCOM (now EDUCAUSE National Learning Infrastructure Initiative). Especially in the area of metadata IMS

cooperates with ARIADNE. IMS bundles several working groups, which since 1997 have developed standards in the areas of: Metadata, Enterprise, Content Packaging, Questions & Tests, Learner Information. At the beginning IMS, ARIADNE and IEEE worked together in the development of the metadata standard LOM. In the meantime IMS created a new metadata specification, which takes LOM (Version 6.1) as a basis, but some elements are added, some are redefined, etc. This means that the metadata specifications are departing from each other. Concerning the IMS Learning Design, IMS has approved the Final version (v1.0). This specification is based on the work carried out at the Open University of The Netherlands in the field of Educational Modelling and the specification called Educational Modelling Language (EML, [8]). This seems to be an approach in the right direction. It is the first specification, which tries to put a structure on everything and it focuses the didactical process directly (it concentrates not only on the technical model).

Alliance of Remote Instructional Authoring and Distribution Networks for Europe (ARIADNE): The ARIADNE-Project was established by the European Union and the Swiss Federal Office for Education and Science. The ARIADNE project treated the development of an international system of knowledge pools (KPS). These knowledge pools can be understood as pedagogical elements and training resources. In addition tools for creation, maintenance and reuse of learning resources were created. Within the project two specifications were developed, one for indexing resources and learning objects (including a guideline for metadata) and the other for describing a course structure. The origin ARIADNE metadata specification was harmonised with the IMS metadata specification and submitted jointly to IEEE, where it became the basis for IEEE´s LOM standard (Version 6.1). Therefore, there exists a mapping of today's ARIADNE elements and DC or LOM elements, but again the format for coding the metadata is not specified.

Aviation Industry CBT Committee (AICC): AICC funded in 1988 was a pioneer in the area of guidelines for e-learning environments. The main aim was to develop and to publish guidelines for developing, using and describing CBTs (Computer-Based Training). Since 1988 10 AICC Guidelines and Recommendations (AGRs) have been published, including recommendations for courseware interchange, web-based computer managed instructions, digital video, digital audio, courseware delivery stations, etc.

Advanced Distributed Learning Initiative (ADL): Within ADL organisations like IMS, a consortium of several US government organisations, 1600 universities and more than 150 companies (Microsoft, Apple, General Motors, etc.) are working together since 1997. ADL´s main aims are to build a network for web-based e-learning and the development of reusable learning objects, to allow a faster development of dynamic and cheap software to establish a broader market for e-learning and to give access to high-quality e-learning contents, which can personalized. To be able to achieve these goals ADL developed SCORM (Sharable Content Reference Model) that separates learning contents and learning applications and specifies how they should work together. Actually SCORM is a combination of various standards and it is an approach not to create more small standards, but to think and develop globally to establish a common base for the developments in the e-learning market. Within this combination of various standards, the SCORM Content Packaging Information Model 1.2. [9] is based at the IMS CPS, but is augmented with SCORM specific elements (especially in the organizations section). Originally, SCORM 1.1 was derived from the Aviation Industry Computer Based Training Committee (AICC) Computer Managed Instruction. So SCORM 1.1 is a sub-set of the AICC work. The development of SCORM 1.2 and IMS CPS showed that both used the same hierarchical concept for structuring, but different terms. Therefore now SCORM adheres strictly to the IMS CPS, but extends it in order to assure compatibility to SCORM Version 1.1.

The consequences of today's specifications and standards

Above there are only mentioned some major players in the world of specifications and standards. But there exist many many more companies, organizations, etc., which are creating specification in the area of Distance EducationSo, not only at the first sight today's specifications and standards seem to be inhospitable. Which problems are caused by today's specifications and standards?

One problem is that there nearly exist as many specifications or standards in Distance Education as working groups or organisations exist. Most of the organisations are working in various areas and are providing at least specifications for each area.

Within an organisation most times the different specifications are interrelated. This means that sometimes specifications of one organisation are not compatible to the specifications of another organisation.

So, to get an overview about the different specifications and standards is time-consuming and therefore it is a cost argument in developing software for Distance Education. Furthermore, most of the specifications are too complex for practical use. Content developers focus on developing content, adding metadata and support multiple specifications takes too long and is too complicated at the moment. Moreover appropriate tools and support are missing.

Another problem is that the elements of the specifications can often be interpreted differently. There is no exact documentation what is meant by a certain element. To give an example: LOM defines an element called "structure", which is described as "the underlying organisational structure of the learning object". As values "Collection, Mixed, Linear, Hierarchical, Networked, Branched, Parceled, Atomic, Vocabulary" can be chosen. Fine, but what exactly is meant by "collection" or "parceled"? And what is the difference between "collection" and "parceled"? The answer to this question can vary from developer to developer.

But, what is the reason why we have to live with hundreds of specifications in Distance Education? And why are there so many initiatives and organizations?

These questions are not easy to answer. One reason maybe is the difference in the European and American way of standardization. Europeans tend to find solutions on a governmental basis and so several governmental institutions and organizations are founded to work in this area. In opposite to that the Americans often work out of market-driven situations and are pluralistic.

Another reason is that only a few years ago, there was no common language. This has now changed because XML (Extensible Markup Language) [10,19] has become the lingua franca in many areas. Because of the widespread use of XML it is now becoming easier to integrate or adopt different specifications and standards.

A third reason is that Distance Education is very much culture-based. Different societies have contradictory educational systems (different school/university models) and therefore a divergent understanding what specifications should handle, what is essential and what is unimportant. Also within a society or state, there exist multiple specifications. E.g. the Austrian Federal Ministry for Education, Science and Culture initiated the development of a standard for metadata especially suited for school [4]. This specification is partly based on LOM, but adds several other school-specific elements. For that reason it can be foreseen that this specification will not be implemented at universities or in the area of adult continuing education.

Last but not least, it seems that one reason is simply a political and economical one. "In a recent macromedia survey of corporate and government e-learning developers, a convincing 93% said that standards were either "very important" or important. [9]" This shows - apart from the advantages of using standards (which are mentioned above) – that the use of standards is also a marketing argument. Customers will force developers to support and to integrate various standards. So one reason of having so many specifications and standards nowadays is that the organisations and institutions are competing, their race-condition is to develop and disseminate a specification as fast as possible to become the leader. In the sense of "the leader takes it all" - DE has become a battlefield for specifications.

What is the consequence of missing one agreed standard? It means that at the moment it cannot be foreseen, which specification will make it. But as said before, the market already forces Distance Education products to support certain specifications. Therefore developers are forced to implement not only one, but several specifications. This increases the development costs.

Finally, because of just having specifications and not a final standard, there are always various releases. So, when one has decided to support special specifications, the support has to be maintained and extended with every new release. This implies that each tool or product has to cope with that. For instance, WeLearn – Web environment for Learning - Release 2.0 and WeLearn´s Offline-Converter [6, 17], both developed at FIM - is in use at several universities (University of Linz, University of Zurich, etc.) various high schools in Austria and in the area of adult continuing education. Within these tools we support CPS (Content Packaging Specification [12]) of IMS. Since, we have included this specification IMS has published several versions of it. In case of a new release both tools have to be adopted to the new version and in addition it must be ensured that the old version is still supported or that a conversion tool from the old to the new version is developed, because users may have built CPS packages with the old version and they will refuse to further use the products when they have stranded investments because they can not use their CPS packages anymore. In order to accommodate quickly to changing specifications we implemented a computable model. This is independent from a specific DTD – it is more abstract – and therefore we can react immediately to changes. It also allows implementing changes incrementally and the possibility to cope with exceptions and special cases is given.

Conclusions

Surely standards are needed in Distance Education. Customers have already started to force developers to support specifications and standards. However, the use of standards bears several advantages, such as a decrease of costs, an increased interoperability, quality, accessibility, etc.

At the moment many organizations and institutions are already developing specifications in various areas of Distance Education, such as content packaging, metadata, user profiles, communication, etc.

But unfortunately there exists no international agreed standard and the various specifications are changing rapidly. In addition to that, some specifications are too complex for practical usage (e.g. metadata specifications for content authors). And last but not least several specifications are not described and specified exactly, so that each developer can interpret them in various ways.

We are both - customers and developers – it is on us to find a solution and conferences like the EDEN Conference can pave the way, to establish one internationally agreed standard.

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