

# Standardization in e-Learning

Ralph Barthel, 21 LearnLine AG

Kontakt:

Stühlingerstrasse 21

D-79106 Freiburg

Tel: +49 (0)761-2026790

Fax: +49 (0)761-2026799

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## 1. Standards - an industry need

The application of standards can be seen as driving factor for industries. The importance of the World Wide Web (WWW), for example, is closely related to the usage of standards like TCP (Transmission Control Protocol) , IP (Internet Protocol), HTTP (Hypertext Transfer Protocol) and HTML (Hypertext Markup Language). For another great example of standards as driving factor for the evolvement of an industry, we take a look at the video consumer market. Only after it had been decided that VHS would be the format for videotapes, the industry started to prosper and the consumer market started developing fast.

In general, standards can help mitigate the risk of an investment in branches that are exposed to fast changing environments.

The e-Learning industry is economically driven by similar needs like other branches. However some additional factors have to be taken into account when designing e-Learning standards.

Goals of standardizations in e-Learning are [Pawlowski/Adelsberger 2001]:

- **Reusability:** of learning contents, teaching methods and specifications in different learning environments
- **Reuse of content:** in a different context. This implies that standardized information about the learning content itself must be available.
- **Interoperability:** Standards for learning technologies have to be independent from system environments and applications.
- **Economical:** of development processes and Total Cost of Ownership (TCO) for learning applications. Standards can help to cover invests in that sector.
- **Flexibility:** The application of standards should not limit the teaching and learning processes.
- **Simplicity:** The implementation of a standard should be effortless to increase the acceptance of developers and authors of learning applications.

Recent and applicable standards mainly cover technical and economical aspects. In the near future there will be a growing need for standards that deal with didactical issues and challenges.

## 2. Standards - an overview

Ongoing research and developments in the field of e-Learning are conducted by different standardizations initiatives. It is not within the scope of this article to describe all these initiatives and their main goals in detail. The following list are a few of the main players who are driving the development of standardization bodies for e-Learning.

- Aviation Industry CBT (Computer-Based Training) Committee (AICC)
- ADL Advanced Distributed Learning → Sharable Content Object Reference Model (SCORM)
- IMS Global Learning Consortium, Inc.
- Institute of Electric and Electronics Engineers (IEEE) Learning Technology Standards Committee (LTSC) - developments are on an abstract level. Work hand in hand with other initiatives.
- Deutsches Institut für Normung (DIN)

From a practical point of view there are only two applicable models for browser-based learning environments available. Those models are the

- AICC standard and the
- Sharable Content Object Reference Model (SCORM).

AICC and SCORM are standards that are accepted and widely adopted in the market. Both standards are supported by approximately 80 % of the “commercial” Learning Management Systems (LMS) on the market.

The support for AICC and/or SCORM by open source software is another story. Very few open source-based LMS are supporting those models. The lack of compliance to standards along with missing services offered is one of the main obstacles for a growing market share of open source e-Learning software especially in the corporate market. The it@ab network platform CLE (Collaboration Learning Environment) is the only open source-based Learning Management System that is compliant to SCORM available today.

In the midterm SCORM will most likely be the most important e-Learning standard initiative due to its extensibility and broad acceptance. The AICC specification is a bit out of date and cannot easily be extended.

At this years european leading e-Learning fair Learntec the trend to move towards standard solutions in the content and learning infrastructure sector (Learning Management Systems, Authoring Software) was pervasive.

In consequence the support of the Sharable Content Object Reference Model (SCORM) when developing e-Learning solutions is a “must have” in order to be competitive at the market.

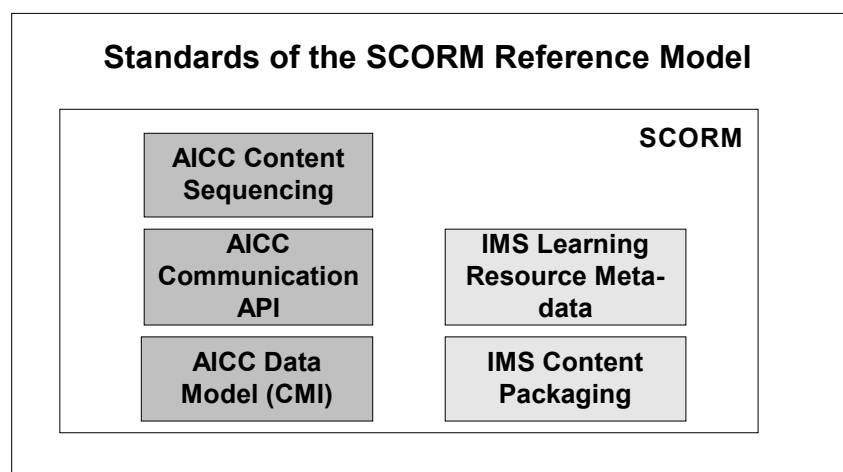
All e-Learning products of the it@ab network have been developed compliant to the SCORM Reference model. **All online training content, the authoring software and the Collaboration and Learning Environment CLE are compliant to SCORM. The marketing of this products can strongly rely on this feature. The offering of services related to the first available open source-based Learning Management System that is SCORM compliant is enabling a unique selling proposition for the network partners.**

The it@ab blended training product “Business related IT Training and Consulting” will be showcased at the International Plugfest Conference in Zurich, Switzerland. Plugfest is an international conference on SCORM and related developments. Please see the official SCORM website (<http://www.adlnet.org>) for further details.

### 3. Sharable Content Object Reference Model (SCORM)

SCORM is not a standard itself it is a framework for inclusion of several standardization bodies. This concept enables the extension of SCORM by adding further standards in the future. IMS Learning Design is a candidate for the next major SCORM release. This specification targets didactical aspects of online learning applications [IMS 2003].

The following graph shows the specifications that are part of the Sharable Content Object Reference Model (SCORM) in Version 1.2.

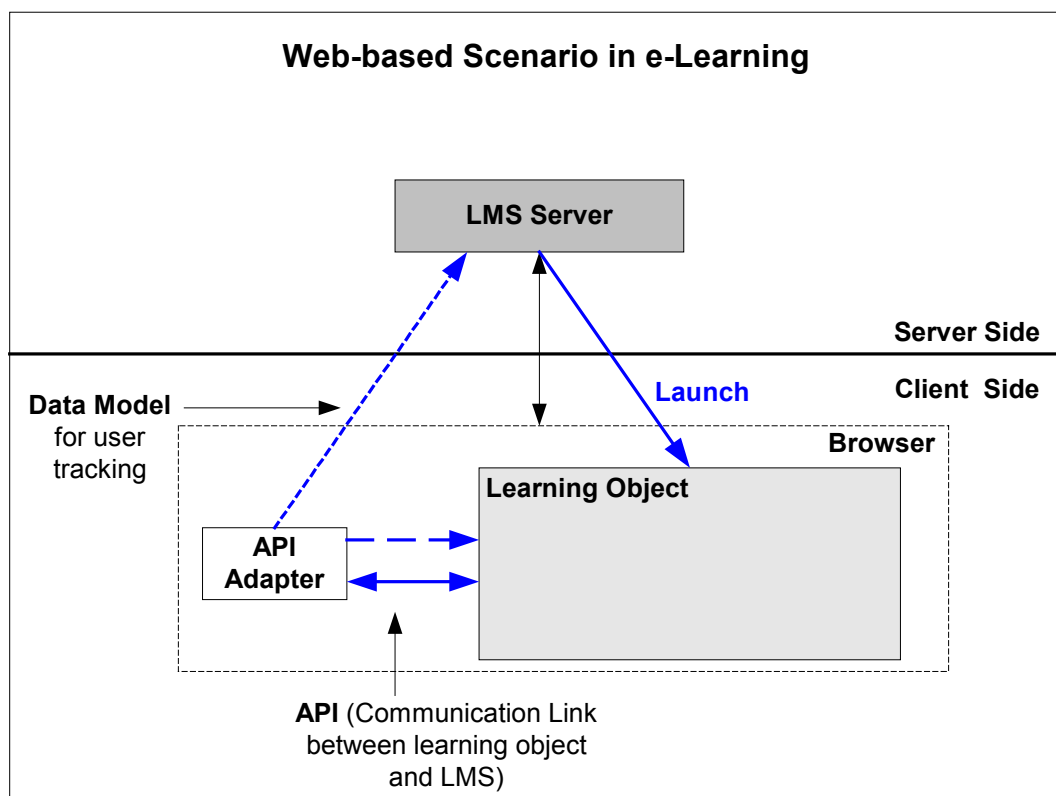


Graph 1: Specification of SCORM 1.2

The development of the AICC standard with some modifications describes the run-time environment in SCORM.

For the content aggregation in the recent version of SCORM, IMS specifications are used to meet the high-level goals.

SCORM is a standard for learning applications deployed through the Internet. The following graph shows a typical scenario for the usage of online learning applications.



Graph 2: Scenario for online learning

From the scenario one can see that a few high-level requirements have to be fulfilled to meet the previously named goals of standardization efforts. Requirements in this scenario are:

- Content needs to be described in such a way to allow a learning management system to display the structure of the learning content.
- An Application Programming Interface (API) that describes the settlements for a communication between a content application and a learning management system. This includes on one hand an interface description and on the other hand a data model that can be used as a common language between client and server for communication purposes.

- A launch mechanism that relies on information about the location of the resources a learning management system has to start when requested by the user. In addition this mechanism should allow the passing of initial values if needed.

### **3.1 Run-time Environment**

To enable a run-time interaction between a content application and a learning management system SCORM defines a JavaScript based API. The LMS Server must expose a JavaScript API Object in the DOM Structure of the browser, which can be used for communication [ADL 2001b]. The usage of JavaScript as single mean for communication however raises several issues [Singh/Bhardwaj 2001].

It is surprising that an important business process like the API strongly relies on the client. Hopefully the next version of SCORM will allow alternative implementations of the run-time environment. One suggestion is to use an XML-based API in the next versions of SCORM [Lindesay 2001].

Which technologies or architecture the learning management system finally makes use of is not within the scope of the specification.

A data model describes the language used by the communication partners for the exchange of information like the student name, the status of a learning object (passed, failed, attempted), etc.

In addition the support of a very basic scripting language deriving from AICC developments (AICC Content Sequencing) should allow the control of the sequence flow of learning objects based on conditions. For example, a learning object might only be visible or accessible if it is dependent on the completion of the previous learning object. In SCORM 1.3 IMS Content Sequencing, which is a more extended specification targeting the same subject, will be included. The AICC Content Sequencing is therefore not supported by the Collaborative Learning Environment CLE. AICC Content Sequencing is an optional part of the specification and we believe that in the midterm a support for the mentioned IMS Specification should be implemented. We believe that the application of the IMS Content Sequencing specification can improve the didactical quality of the offered online learning solutions.

### **3.2 Content Aggregation Model**

The content aggregation model in SCORM offers a way of deploying learning contents in different system environments. The content consists of retrievable, reusable and interoperable learning objects.

For that purpose the two specifications IMS Content Packaging and IMS Meta-data (support of this specification is optional) have been included.

IMS Content Packaging contains a XML-based description of the content structure and information about the related resources necessary to start the learning contents. In order to implement the specification properly in a learning management system it is necessary to use an XML parser to check content packages for compliance with the specification.

The IMS Meta-data specification is optional. In order to reduce the complexity of the first implementation of the SCORM interface, it has been decided to exclude IMS Meta-data support. The purpose of this specification is to describe learning resources in a standardized way with a set of meta data. This information could be used for a catalogue system to name a typical application. For more detailed information on the concepts of meta data see the ADL [ADL 2001a] website.

## **4. Open Source-based Learning Management Systems**

Open source-based Learning Management Systems (LMS) are becoming more popular on the market. The market demand for open source software in this domain is increasing. The difficulty decision makers are facing are

- to identify the movements that will tend to be sustainable by relying on a strong community and
- that offer additional services (customizing, development, hosting etc.) related to the software.

Recently two solutions available are promising to face the needs of these decision makers.

The first one is **ILIAS Open Source**. An initiative located at the university of cologne. This Learning Management System based on PHP technology has attracted a bigger community within the last years. Some companies are offering services related to ILIAS. SCORM compliance is yet not available for ILIAS but will be implemented in the near future.

ILIAS is a specific software development project for the sole purpose of using it as a Learning Management System.

The second one is the **Collaborative Learning Environment (CLE)** which is available for the it@ab network. The actual online training in the it@ab upgrade program is conducted using CLE. CLE is based on the architecture of ZOPE/Plone technology. Zope is an application server that in combination with the extended content management framework of plone can be configured and extended to be used as a collaboration and learning environment. CLE uses these framework as base like other software projects make use of this application server. This ensures that the extensions of CLE can be used in combination with that standard Zope/Plone environment. This approach ensures the alignment with the developments of ZOPE/Plone and its broad community.

The junior consultants of the it@ab network are getting trained in this technology. This may allow partner organization to extend their portfolio by offering services related to Collaborative Learning Environment (CLE). CLE is the only open source-based learning environment on the market that can import and run SCORM compliant content.

The background of the system as communication and collaboration platform is another added value as it makes the software interesting for organizations who start to move towards online learning offers. CLE can not “only” be used for running online courses but as well for organizing and conducting the business processes related to the educational offers.

## 5. Summary

The concepts of the Sharable Content Object Reference Model (SCORM) are widely accepted and adopted. In the midterm SCORM will become a de-facto standard in the e-Learning industry. Content developers and technology vendors will have to increase and improve their support for the reference model.

Future extensions of SCORM mainly will target didactical enhancements of learning solutions.

Additional players will introduce new standard specifications. Time will show which of these developments will have an major impact on the e-Learning industry.

Few open source-based learning environments are supporting SCORM. This lack of compliance raises concerns in the minds of decision makers. The development of a SCORM interface for CLE is in consequence a unique selling proposition.

The time to market for the it@ab network products has come. In order to maximize the possible return of the developments made for it@ab enhanced marketing activities should be started.

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