

## **Design consideration and implementation issues while developing SCORM compatible contents**

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The aim of this paper is to propose a method for the development of electronic content for use in different levels and occasions, for new learning courses, different types of users and other occasions through spending minimum cost and time. The main problems nowadays in e-learning has been determined and reviewed. We will review the standards of e-learning with emphasis the SCORM (Sharable Content Object Reference Model) model. There has been recommended a model for development electronic content based on reusability of learning objects. In using this method for the development of electronic content much saving can be made both in time and cost.

Keywords: Electronic content, Reusability, Learning object

### **Introduction**

If we want to have a simple definition for the term e-learning, we can define it as follow [2]: “ A method of learning so that all stages of prepare, deliver, and management of learning content are conducted using a variety of learning technologies and can be deployed locally and globally. It is suitable, regardless of the location of the delivering organization, that the quality of deliver and efficiency of learning content are always delivering.

Nowadays cost spent to improve technical skills and knowledge of personnel in organization are not less than thousands dollars, if they are not millions. In the case that learning product can not be improved, thenceforward it will not be useful only for themselves, of course they can, through and planned cooperation, follow and reference model and reuse other’s learning material, so they can save money and time.

### **The problems with the production of electronic content**

Assume a learning institute is going to present their learning materials electronically. The experts provide the institute with preparing and approving its related scientific texts for different topics. Then it follows multimedia software production process as and scenario and story board. In the case the producer prepares and presents related scenarios for each section in assistance with different production groups for images, moving images, audio and video clips....., and lastly prepares the determined learning complex as a software package and presents it to that institute. This production method is completely traditional, by traditional we mean learning software production is considered as it is a book. This produced content is usable just for that period and that institute and the specific objective. But thenceforward this institute decides to apply a little change in learning materials of one course due to some reasons. It must refer to the first producer, deliver the new materials and demands the required change. Here the producer has to produce this course from the beginning, so many processes will be repeated again which itself is time-consuming and of course costly.

In early times, that word software had been used, it was difficult and somehow impossible to transmit data from one to another or even between various versions. Nowadays such and problem occurs for transmitting learning content from one system to another. The problem here is inconsistency between learning content of one learning management system to other learning management systems. The

potential solution is providing interoperability, it is possible to transmit the produced content in one place and by means of some devices to another place with other devices and use it.

Following are the main problems with the electronic content today:

- Maybe the produced content is not usable for all audience with various tastes and different needs.
- Regarding to the rapid improvement of information technology, the produced content will be useless within two years. While it costs the institute too much to produce it.
- To produce similar learning courses, their common materials (for example pictures, films, animation) must be produced separately for each course and this costly and time- consuming.
- The users can not use the learning component according to their tastes, in other words there is no flexibility for using this content.
- It is not possible to transmit the learning content from one learning management system to another one.

## **Learning Management Systems (LMS)** (IEEE, 2007)

Learning management system is and software which manages learning events automatically. All LMSs control registration, user's connection to the system, list of courses and learner's information. such systems also provide management with reports. These systems are created to manage learning process. The term "LMS" can be used to refer to and simple lesson management system and / or and very complicated and distributed system. Perfect learning management systems consist of the following capabilities:

- Managing the learner's profiles and learning instructions
- Learning planning
- Presenting and following the content and evaluating the learner.

## **Standards of e-learning** (ADL, 2006)

### **Abilities**

Rapid improving on e-learning under internet, it is necessary to have suitable standards. Expanding e-learning standards to design and present e- learning content causes some capabilities.

Standards guarantee the following capabilities and are useful to protect and even to increase e-learning capitalization yields:

- Interoperability: this is the capability of receiving developed learning component in and system and applying them in other systems. This capability provides with selecting the best designer, best devices, best content and Best management system.
- Reusability: This is the usability of learning compiles in several practical and several learning courses. By means of this, learning content can compositions together and separate easily and quickly and reuse in other point.
- Manageability: this capability is to follow the learner's use from e-learning system and to save the result as a record. This record is accessible for learner and management.
- Accessibility: this is accessibility of learning component by several places and presenting them in other places.
- Durability: This can be defined as sustainability against technological changes over time without need to many expenses for redesigning, structuring and code-writing.

### **Review on SCORM** (ADL, 2006)

SCORM (Sharable Content Object Reference Model) defines reference structure to produce e-learning content with perfect details applying standards and specifications generated by different groups of a

model. By SCORM model, learning content, learning technologies and system can communicate with each other and so expected standards and metrics of e-learning standards will be met. SCORM is not a standard by itself, but it is a reference model which tests and controls practical efficiency of a set of independent standards and specification. SCORM cooperate with standardizing organization like IEEE, IMS and AICC for complex-making of their specification in a practical and comprehensive model and also for determining key relationships between standards. More details about SCORM is available on ADL website and the address is written in References.

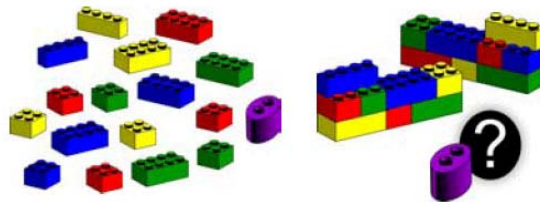
## Procedure - Reusability of learning objects

### Concept of Learning Object

Definition of learning object: A learning object is a component independent and separate from learning content which follows an independent learning objective [1]. In the old paradigm, learning had been organized as a compositioned set of learning lessons and courses which followed specific and pre-defined learning objectives. Here it is suggested to separate the learning content of lessons and courses into independent and smaller component so that each component consists of separated learning content. Each component can either individually or in assistance with other learning object meet the learner's needs everywhere and any way.

### Comparing learning objects to LEGOs

In order to define this new learning design, we can compare the learning objects and modular content to LEGO pieces. As we know LEGO pieces have independent and individual shape. There are relationships between these pieces and it is possible to create different compositions from these pieces based on that relation. Each LEGO component has a capability that can be compositioned in different usages with other LEGO pieces. But if these pieces have not a standard frame can not be used in compositioning with other pieces. (Figure 1)



**Figure 1: different compositions of LEGOs**

In the learning world we also encounter to learning pieces which can meet different learning objectives in different compositions for various audience. We can compare the smallest piece of raw learning content to LEGOs( for example text, graphic, audio, video.....). Raw object can be used in different compositions. For example, an image can be used in and screen, while we can use the same image as one option in multiple choice questions. These objects, when needed, can compositions with each other and separate, so provides a high flexibility. Under this flexibility, various logic compositions will be available which meet different learning needs. (Figure 2)

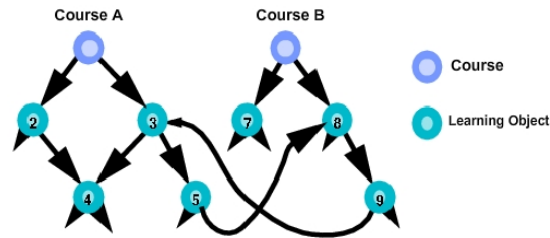


Figure 2: different compositions of Learning Objects in various courses

### Reusability of learning objects in different levels

Reusability means, as a common able content object for a course, a content piece can be used in other different course to meet other user's demands. Anyway the solution is followed as the content of learning courses divide into the small and independent pieces. Then related learning objects are produced and stored content store. Now it is possible to use these independent objects in new learning lessons and courses. Each object posses reusability in different learning compositions in order to meet various needs. So in the case of changing the learning content, it has to change the related learning object only and this has no effect on other objects. Since these objects are produced independently based on standards, they are reusable and transmittable in other learning systems. Figure 3 shows reusability of objects in different levels.

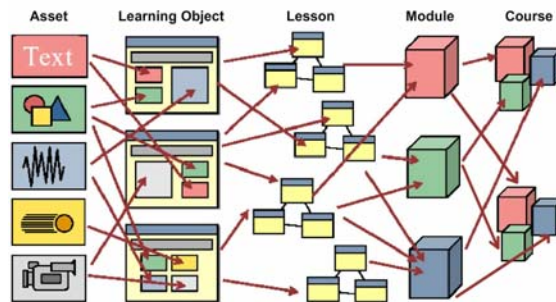


Figure 3: Reusability in different levels

Autodesk company defines its strategy for reusability of learning objects as follow [2]: In the model of this company, a five-layer structure is used to present the content model. In this model shown in Figure 4, learning objects consist of objects in the lowest level of raw media objects to a lesson level. As a result, an information bank has reusable learning objects and information which can be used in order to various learning like e-learning, traditional instructor-led learning and/or compositions learning.

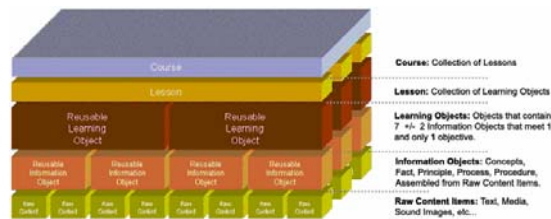


Figure 4: Five-layer structure is used by Autodesk Company

### Inconsistency or consistency of context and reusability] (Maisie, 2003)

These two capabilities are extremely valuable. The context capability is necessary and has a direct relation with efficiency and effectiveness of content of learning, and reusability also has a direct relation with return of investment for learning content. The raw content component is information blocks which

are extremely small and has no notable usage, so individually does not have context capability. But if we compositions these small information blocks together, it provides with context capability. The inverse relation between reusability and context capability is shown in Figure 5.

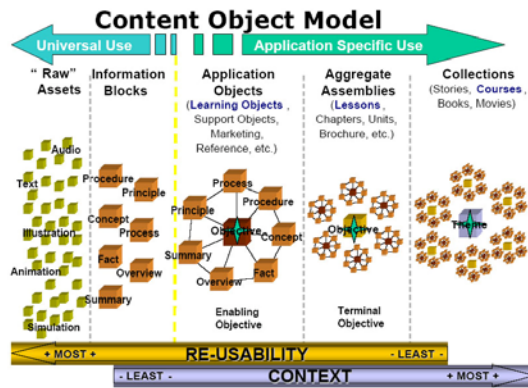


Figure 5: Reusability versus Context

## Conclusions

Today one of the main problems with the e-learning is that thenceforward learning content will be useless and also the produced content is usable only in that time period and can not be transmitted to other learning systems. In this paper a design is presented in order to solve the above problems and other determined ones. Under this design, learning content should so be produced that are reusable in different learning compositions to meet various learning objectives. A reusable learning object is a content piece produced based on the above design. In this text we present capabilities and specifications for standard reusable learning objects.

The other important point is considering standards in producing electronic content. The main standards in this frame are presented in SCORM model. Considering this point is very important that electronic learning standards provide capabilities but do not guarantee them. Anyway electronic learning market will continue to its improvement for designing reusable content and content-producers have to adopt related standards and continue their activities in this way.

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