BEYOND INTEROPERABILITY : QUALITY CONTROL OF LEARNING OBJECTS

Ravija Srivastava

Abstract

Learning objects are building blocks of e-learning . They are found embedded in various types of environments viz. institutional repositories, VLEs/MLEs, online learning repositories and personal repositories. In the distributed environments it is difficult to locate a desirable LO to match with a given set of learning objectives, hence various standards pertaining to interoperability of the repositories and to facilitate cross-searching, accessibility, reusability, aggregation of LOs have been developed. But there is no agreement on the use of instructional design and verification of the content of a LO. The present study outlines quality control measures currently practiced by the managing organizations of selected representative learning repositories, with respect to these two criteria only.

Keywords : Learning Objects, Online Repositories, Quality Control

1. Introduction

That the future of any area of activity largely depends on the inexorable technological evolution, is undisputed. In instructional technology, the concepts of pedagogy and the theory of object orientation from the computer science combined together resulting into an interesting element of e-learning : the "Learning Objects". Object Oriented Programming deals with creation of structurally independent components known as "Objects' which can be used and reused in multiple contexts. For instructional purposes, it is possible to create such elements or components and achieve numerous pedagogical possibilities.

The Learning Technology Standards Committee (LTSC) of IEEE was formed in 1996 with the primary goal to develop and promote instructional technology standards. It has defined Learning Objects (LOs) as ;

*Any entity, digital or non-digital, which can be used, reused or referenced during technology supported learning***(1)**

Examples of LOs include

Multimedia content, instructional content, learning objectives, instructional softwares and software tools, and persons, organizations or events referenced during technology supported learning.

This standard definition has been variously interpreted to suit different learning environments. Wiley**(2)** further explores into the subject and has elaborated upon different meanings of the term and also alternative terms used in the documented literature to refer to the same concept viz. "knowledge objects", "instructional components", "pedagogical documents", to name a few. In the same sequence he has succinctly defined LOs as :

Any digital resource that can be reused to support learning

Drawing an analogy from the structure of chemical compounds, structure of atoms and atomic bonding, Wiley has identified eight characteristics of LOs and on its basis classified them into Five classes viz., (1)fundamental, (2)combined-closed, (3)combined-oen, (4)generative-presentation, and (5)generative-instructional. Though this is a comprehensive work on the theory of Learning Objects with respect to pedagogical aspects, few important and practically viable features like accessibility find emphatic mentioning in Oakes**(3)** definition :

A learning object is a self describing, self contained small chunk of learning that accomplishes specific learning objective

The inclusion of the term 'self describing' iterates the need to make each LO distintly identifiable and accessible so as to facilitate just-in-time learning.

It is, therefore, derived from the above discussion, that LOs are units of knowledge which can be assembled together in different combinations to construct an educational package (may be a complete course or a lesson). They may take the form of text or graphical presentation or audio/visuals/multimedia presentations or animations etc or a combination of these.

2. Discovering Learning Objects

E-learning is basically an outcome of sharing and scholarly openness finally making their way into traditionally rigid and closed pedagogy. These paradigmatic changes owe their existence to the challenges of rampant mass education and ICT revolution and have resulted into different types of organized collections on the World Wide Web (WWW). Academic institutions share their resources via Institutional Repositories (IRs), Virtual Learning Environments (VLEs)/Managed Learning Environments (MLEs), Learning Objects Repositories and personal repositories. Learning Objects are found embedded into these environments, these environments may belong to any of the following categories :

1. Open / Closed / Closed(membership)
2. pointers (metadata only) / resources (of the LO)

Institutional repositories of Universities and other Higher Education Institutions are developed to make indigenous intellectual outputs such as e-prints, datasets, video, learning objects, software and other material , accessible to the outside world, having closed access. Since the assets are contributed by the faculty of the institution, instructional material comprises lecture notes, exercises, presentations, demonstrations, compilations etc. developed for the purpose of teaching and are tested and modified from time to time.

In VLEs and MLEs, learning objects form a part of a certain course schedule, therefore they are accessible only to the registered students. These LOs are constantly in circulation and receive regular feedback from the users.

Thirdly and most importantly, Learning Object Repositories, exclusively devoted to the learning objects are fast appearing on the Web. They are of various types depending upon their scope, coverage, and the managing organization/body.

(1) General repositories e.g. JORUM , a national repository in UK accepts materials from all institutions in the nation willing to share their assets, is managed by JISC supported national data centers.

(2) Discipline-Specific repositories e.g. DLESE , is a component of National Science Digital Library , which accepts resources from educators in US “in their area of greatest expertise and interest”.

(3) Commercial repositories e.g. Xanedu, Telecampus (only archives)**(4)**

3. Interoperability

Interoperability in e-learning can be viewed in two different perspectives. At the first level , the target is accessibility, which is achievable through standards and specifications followed strictly by all the community members. At this level we have to ascertain that every LO in all the repositories become accessible from any of the working platforms. It needs to be mentioned here that closed LOs embedded in VLEs/MLEs may not be necessarily accessible but their metadata could be made available through other portals.

Second level attempts to create a common interface between the various components of an e-learning system.

LOs can be best shared and used only if they are compatible in terms of software, metadata tagging, instructional design and content.

3.1 Software

The range of repository management software available today has greatly influenced the rate of increase of repositories. Many studies have shown that Dspace and Eprints are the most popular free open source software, other important ones being Fedora, Greenstone etc. The problem arises when a LO from a repository using one software is not accessible to another repository using a different software therefore the current requirement is to gain interoperability among the various softwares. This is to lay down some standards for adherence while designing such a technical platform. An initiative towards this direction was taken up by representative communities from all across the world in form of CORDRA (Content Object Repository Discovery and Registration/Resolution Architecture) which is “An open, standards-based model for how to design and implement software systems for the purposes of discovery, sharing and reuse of learning content through the establishment of interoperable federations of learning content repositories”. **(5).** Another possibility is to make these softwares interchangeable at any required time. In 2004 Dspace collaborated with Google to enable cross-searching within Dspace communities. All such attempts are to increase interoperability at the technical level.

3.2 Metadata

Possibility of cross-searching depends on at least one more parameter i.e. meta tagging. Standards like DCMI, LOMS, IMS Metadata Information Model aim to identify data elements for the exact description of an item in digital collections. Of these DCMI is not very specific about LO metadata, whereas IMS has identified 86 elements to be included in a LO metadata. In a more comprehensive grouping LOMS of IEEE enlists nine optional categories of metadata content, which cover bibliographic description, social & technical context, revision history, software and hardware specifications, usage history, experiences, requisites for learner, etc. about a LO. Uniquely this list includes “meta-metadata” referring to the specific descriptive record which may have been compiled for a specific purpose by a person, hence also becomes a piece of intellectual property.**(6)**

3.3 Instructional Design (ID)

Many instructional technologists are concerned about the overemphasis laid upon technical standards and guidelines (Wiley), rather than the instructional gains of LOs. Harvey contends, “solid ID is a critical part of reusable LO design”. Since reusability is the basic requirement of an LO, it has to have very specific learning objectives so that it can be used in multiple contexts. Therefore each unit needs to be smaller in size in order to be able to achieve greater reusability. This necessitates the use of appropriate Instructional Design at both development and aggregation stages. In this way the problem of differing learning styles can also be taken care of. There are many ID theories available in literature and by adhering to any of these it is possible to create LOs with high reusability effect.**(7)**

3.4 Content

LOs are products of highly intellectual activity, requiring combined efforts of technologists, educationists and subject experts. Therefore to design a LO an educationist would first define the learning objectives and an appropriate instructional design, then the subject matter is outlined by the subject expert, lastly it is written in XML or SGML or any other suitable markup language by a software technologist. The content of a LO should be professional, accurate, specific, correct and technically well coordinated within the framework of the object.

4. QC in Learning Objects

The four parameters enlisted above are the basic component features of LOs, these are also the checkpoints for quality control. As we have already seen, for each parameter there are various standards, specifications, practices and potential possibilities and challenges faced by the education community. ADL’s SCORM is a concerted effort to bring about uniformity with respect to more than one of the above stated parameters. It addresses “portability, reusability, data tracking and sequencing”**(8)**. Assuming that all the LOs on the Web are developed using SCORM standards there is still no quality assurance about the learning outcomes of such products. The reason is simple. SCORM does not cover two important aspects of LO development viz. content of LO and ID of individual LO. Other standards also concentrate on metadata, interface interoperability and aggregation of LOs.

Consequently, as yet there are no standards to develop LO of high quality learning outcome which would refer to matching content with learning objectives. Federations and repositories use different measures and practices to evaluate LOs against certain criteria identified for their own environment. The present study focuses only on the two areas which have been left out of the purview of standardization.

In the following section some of the effective practices to maintain quality of LOs procured in their respective collections, are enlisted. The author does not attempt to evaluate these evaluation measures but views them as best practice methods which need to be developed into standards in future.

1. expert review
2. collaborative community review
3. combination
4. user-creator interaction
5. free collections

4.1 Expert Review method

DLESE maintains a section of its collection under the category of “reviewed collection” which consists of those LOs which get a clearance through an evaluation against a set of seven criteria covering not only the accessibility issues such as metadata and ease of use but also instructional features like “scientific accuracy, pedagogical effectiveness, significance of the content, etc.”**(9).** A committee of experts reviews each LO submitted to the depository and then it is made accessible for use by placing in the respective category. A similar system of evaluation is used by CLOE which measures a LO against quality of content, effectiveness as a teaching/learning tool, and ease of use. In this case there are two categories of evaluators involved in the peer review process :

instructional designers appointed by CLOE members, and (2) subject experts identified by the institutional affiliations in consultation with the creator/s of the LO in question. This democratic structure of review committee comprising one instructional designer and two subject experts is an ideal arrangement and one of the best practices and can be used in future as a reference model. **(10)**

4.2 Collaborative Community review

SPLASH , a portal for learning object repositories believes that users are the best community to judge the relevance and quality of the product. Therefore its user community drafts the framework and criteria for evaluation and finally reviews the LO against them. Such user reviews are implicitly closed in character as the control is entirely entrusted within a restricted group. One of the sections of DLESE is also managed in this manner. It is termed as the “broad collection” and the purpose is to “provide an extensive variety of resources and to create a forum in which users’ feedback helps creators iteratively improve the quality of individual resources”**(11)** The drawback of this system is that the users are not experts in instructional technologies and their knowledge about the potential uses of technology may be limited. Hence a support mechanism is required to help the users explore and experiment with ideas.

4.3 Combination

This method is a combination of the first two. The expert committees select materials and evaluate them against pre-defined criteria. Then they prioritize the LOs and is posted for trial and rating by the user community on a scale of e.g. 1-5. After the trial period the user feedback is used as the basis of review process and if the norms are met by the LO then it is uploaded for public use. MERLOT **(12)** such a structured peer review system where experts indirectly collaborate with the user community. It has fourteen editorial boards for each of the subjects in its classification and ensures at inclusion of at least two higher education faculty members. This system concentrates more on subject accurateness and coverage rather than the instructional design. The users feedback is based upon what is currently being offered to them, although there may be hidden potentials to suit their needs better which would otherwise be explored only by an expert instructional designer.

4.4 User-creator interaction

This is the simplest form of quality enhancement process. The repository may offer a coordinated forum for the users along with the collection organized in some manner (may be subject wise as in the case of Learning About Learning Objects portal), to be used as a platform for exchange of ideas and experiences.**(13)** There is no involvement of the managing body, through the discussion lists or listserv the creators gather responses from users and take appropriate measures to enhance the quality of their products if required.

4.5 Free Collections

Still in the planning stage, JORUM (14) not identify any quality control guidelines in its information brochure on the web, although there is a mention of some kind of forum to facilitate exchange of views. Recently it has opened its doors to contributors and very soon will be launching the users account. Let us hope that it also adopts certain guidelines in order to have a certain level of quality control over the material it is going to collect.

Collections which are just deposit centers without any scope (in present or future) of quality control measures may over a period of time become unauthentic and lose their popularity.

5. Conclusion

Johannsen in 1992 "foresaw the risk…..as the general principles of quality control have originally been developed in the private sector and industrial environments….." one should always be prepared to face problems while trying to use the same "…principles to manage quality of intangible resource…".**(15)** This holds absolutely true in the environs of education, pedagogy and instruction. At the same time in a tremendously proliferating technological milieu where one is liable to encounter new challenges and potentially rich options at every step, the burden of maintaining standards and quality increases. LOs are still in their infancy and till now the researchers have concentrated more on their technical viability. Whereas it needs to be contended that technology is only a faster and efficient means to an end. The purpose of pedagogy and the instructional outcomes largely depend upon the quality of content and the instructional design. With more new repositories and federations and portals of repository collections coming up on the WWW, the necessity to define standard practices and guidelines to be strictly followed, just as peer review became a standard practice for scholarly journal publications in print media, is highly required as of now.

6. References

1. Wiley, A. David. "Connecting Learning Objects to instructional Design Theory: A Definition, a metaphor and a taxonomy". http://www.reusability.org/read/
2. Wiley, A. David. "Connecting Learning Objects to……" op.cit.
3. Oakes, Kevin. "An Objective view of learning objects". http://www.findarticles.com/p/articles/mi_m0MNT/is_5.56/ai_87943002
4. Learning Object Repositories : http://elearning.utsa.edu/guides/LO_repositories.htm
5. Kraan, Wilbert; Mason,Jon. "Issues in federating Repositories; A Report on the First International CORDRA Workshop". D-Lib Magazine, v.11 no.3, March 2005.
6. ARIADNE : http://www.ariadne.ac.uk/issue41/godby/intro.html
7. Wiley, A. David. "Connecting Learning Objects to….."op.cit.
8. SCORM : http://www.adlnet.org/scorm/articles/3.cfm
9. Kastens, Kim et al. "Questions & Challenges Arising in Building the Collection of a Digital Library for Education: Lessons from Five Years of DLESE". D-Lib Magazine, v.11, no.11, Nov. 2005.
10. http://cloe.on.ca/peerreview.html
11. Kastens, Kim et al. "Questions & Challenges…." op. cit.

12. MERLOT : http://www.merlot.org/Home

13. Learning About Learning Objects : http://www.learning-objects.cet

14. JORUM : <http://www.jorum.ac.uk>

15. Hsieh, Pao-Nuan; Chang, Pao-Long; Lu, Kuen-Hong. "Quality Management Approaches in Libraries and Information Services". Libri v.50, 2000, pp.191-201

About Author

Mrs. Ravija Srivastava is a Lecturer in Department of Library & Information Science, University of Mumbai. She did her MLISc from the University of Lucknow in 1995. Since then she has worked in different organizations and has experience both in teaching as well as librarianship