

ARCHITECTURE OF MULTIMEDIA INSTRUCTION OBJECTS FOR DISTANCE EDUCATION IN PAKISTAN

By

Nazir Ahmad Sangi^{*}

Muhammad Daud Khattak^{**}

Abstract

The term Learning Object (LO) generally means a small re-usable segment of educational resource. It is relatively new in the educational institution of the developing countries. The adoption of LOs from the developed countries in the developing countries is not an easy option. This paper initially discusses the need of indigenous development of Multimedia Instruction Object (MIO) with special focus on conformance to international standards. It proposes architecture of a MIO with respect to structure, granularity level, and aggregation schema. The structure of a MIO being presented, comprises of four components; each carries multimedia instructions. The paper suggests a finest granularity level for MIOs, maximizing its re-usability along-with educational value in variety of related courses. It also suggests an aggregation schema for an ad hoc path for stepwise learning through MIOs in order to achieve a larger concept of knowledge. Finally, the paper describes implementation of MIOs architecture on a bachelor level course curriculum of Allama Iqbal Open University, Islamabad.

Keywords: Learning Object, Multimedia Instruction Objects, Granularity, Aggregation Schema, Unit

Introduction

The e-Learning has capability to integrate different digital media such as text, picture, audio, animation, and video to create a multimedia instructional material. The multimedia has attracted the learner's attention (Sun & Cheng, 2007) in the learning process. The multimedia course instructions have a demanding potential value in education (Mitchell, 2003), especially in distance education. These offers many potential benefits (De Castro, Carvalho & Carrapatoso, 2005) to modern distance learners such as instructional consistency, ease of delivery and access, increased retention level, and increased learner

^{*} Vice Chancellor, Allama Iqbal Open University, Islamabad

^{**} Assistant Professor, Computer Science Department, Allama Iqbal Open University, Islamabad

motivation etc for better teaching and learning. In many developing countries, the design and development of multimedia instructions for distance learners is not an easy job, and Pakistan is no exception. These are mainly designed and developed as large integrated packages with video as a significant component. Therefore, these are often delivered offline on CDs/DVDs. The video data loaded with heavy graphics may cause problems in local online delivery. Similarly, due to limitations of ICT and Internet bandwidth at the learner's end may raise many questions on online use of large integrated packages of multimedia instructions. Therefore, development of small self-contained objects referred to as Multimedia Instruction Objects (MIOs) is a desirable option (Sangi, & Khattak, 2009).

Literature Review

The rapid development of Internet and other digital communication technologies turned traditional distance learning into modern distance learning (e-learning). It is rapidly growing in distance learning universities as well as in formal universities. The e-learning system consists of different components like curriculum, learners, technology, and e-content. Each component is of vital importance however, e-content is of prime importance. The design, development, and delivery of e-content are greatly influenced by the rapid development of computers and Internet technologies (Mac Donald, et al, 2005). These e-content may be organized as a comprehensive pedagogical entity commonly referred to as Learning Object (LO).

Learning Objects

The term Learning Object (LO) generally means a small re-usable segment of educational resource. There exist many definitions of the term "Learning Object" (Koohang, et al, 2008), however, it consists of two words "Learning", i.e. holding information that enables learning and "Object", meant for small segment or portion of learning resources. The LOs are initially inspired by object oriented programming practice in computer science, which meant to create reusable components (objects) (Toyonaga et al., 2007)

Organization of a Learning Object

A LO is identical to a book chapter providing sequence of learning, and may be organized as learning objectives, actual learning contents, and a feedback. However, according to the LO practitioners, there is no agreeable standard of LO organization (Thompson & Yonekura, 2005). According to Jones & Boyle (2007), there are four components of the LO organization as introduction, objectives,

actual learning contents, and exercise. Similarly, Thompson & Yonekura (2005) argued that, a LO may have components such as learning objectives, content, practice, and assessment.

Granularity and Aggregation of Learning Objects

Two design issues are of prime importance that may be considered prior to the development of a LO. These are granularity and aggregation of LOs. The term granularity refers to as the size of a LO. There are various aspects that may be considered to determine the size or granularity of a LO (Berge, 2006). These are course, module, unit, lesson, or topic in educational terms; number of pages, or duration for completion in terms of instructional time; and bits, bytes, MB, or GB in terms of physical size. Polsani (2003) argued that neither the instructional time nor the physical size is a valid criterion for determining the size and granularity of a LO, as the amount of course instructions in a LO is difficult to measure. Balatsoukas, Morris & O'Brien (2008) and Abdul Karim, Chaudhry & Khoo (2007) suggested the amount of course instructions provided to the learners an appropriate concept of defining granularity of a LO. Similarly, Li et al. (2009) argued that the granularity of a LO is a term used to describe the size of a unit of learning i.e amount of information conveyed to the learner. A few possible granularities in educational terms of a typical LO are shown in the figure 1.

Learning objects

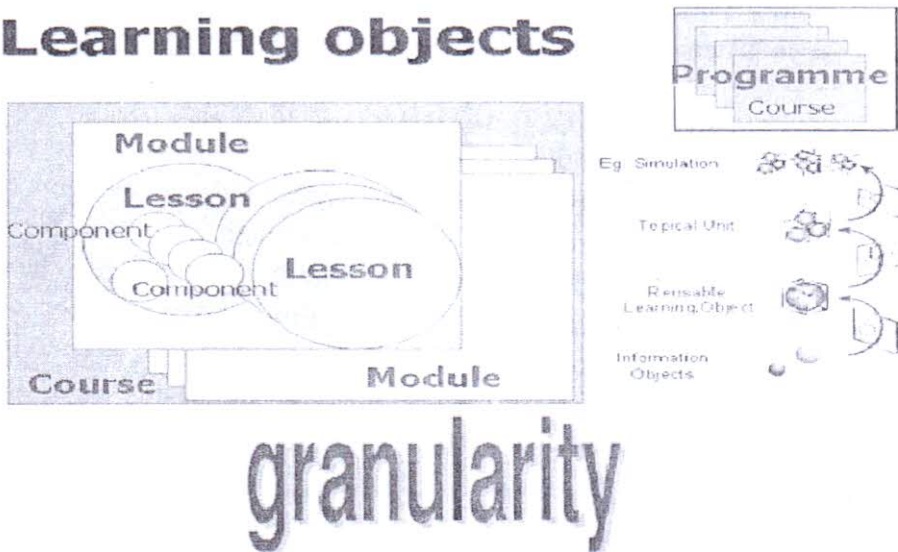


Figure 1. Granularities of LOs, McGreal (2004)

The figure shows that, granularity of a LO may be a small topic or a lesson (aggregation of few topics), a module (aggregation of few lessons) or a complete course (aggregation of course modules). Due to various granularity levels, it may be established that the granularity of a LO may vary from a small topic to a whole course (Del Moral & Cernea, 2005; De Salas & Ellis, 2006). However, there is no universally defined size or granularity of a LO (Abdul Karim, Chaudhry & Khoo, 2007). Despite this fact of undefined universal size of a LO, the granularity is closely related to its re-usability by variety of learners (Ilona, Jurij & Vytautas, 2009). Similarly, Verbert & Duval (2008) and Griffiths, Stubbs & Watkins (2006) argued that low granule of a typical LO has high re-usability.

Learning Objects and Developing Countries

Despite the fact that LOs have potential to play a key role in learning, it is relatively new in the educational institutions of the developing countries. The adoption of LOs from the developed countries in the developing countries is not an easy option (Lujara, et al., 2007), due to major differences in accessibility mechanisms (ICT infrastructure), expertise of faculty/instructional designers, cost/effort needed in the development of LOs, localization issues and different norms among teaching and learning communities. On the other hand, the modern distance education/e-learning needs in the developing countries are growing rapidly in a global competitive environment. Therefore, there exists a dire need and growing demand of the development of; localized LOs that may comply with international standards, and suitable to locally available ICT infrastructure.

Multimedia Instruction Objects (MIOs)

The MIOs may be designed in a manner suitable for delivery in a localized environment. In addition, it may also be tailored to local parameters (e.g. learner's profile, ICT infrastructure, Internet access, and learner's preferences) for compatibility with local conditions. Furthermore, it should also conform to international standards such as SCORM with certain localized characteristics related to pedagogy, technology, academic requirements, and architecture. The subsequent paragraphs discuss the architecture of a MIO, and its conformance to international standards with respect to structure, granularity level, and aggregation.

Structure of a MIO

Considering the above mentioned requirements, the structural model of a MIO is proposed. This conceptual model consists of various components aggregated into a coherent object as given in the figure 2.

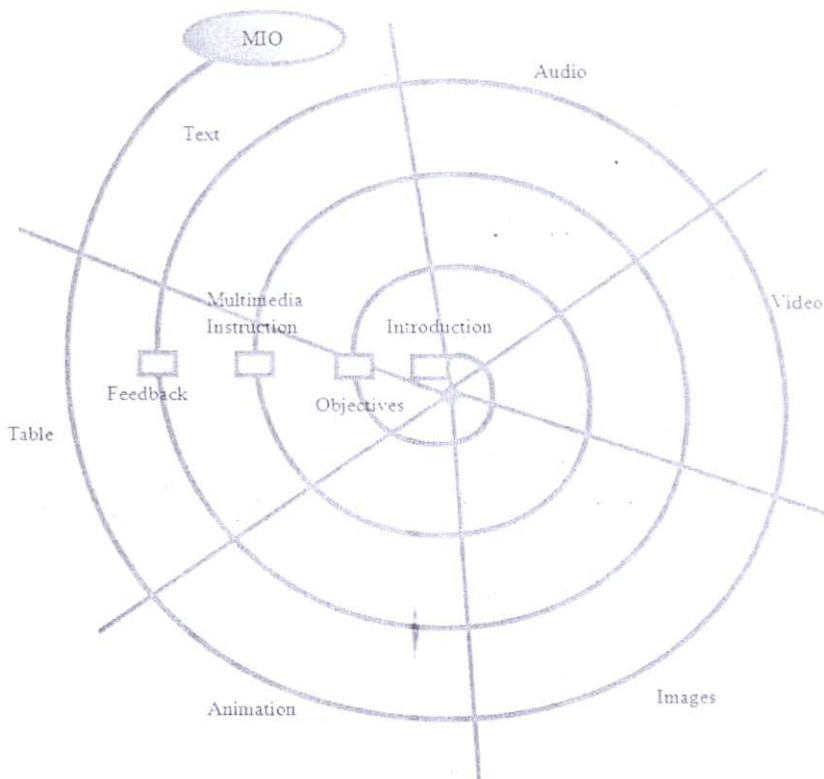


Figure 2. Structure of a MIO

A MIO may consist of four layered components. The introduction gives a brief description and background information about the course instructions presented in a MIO. At second layer, objectives describe learning objectives that a MIO may fulfill. At core, the actual multimedia instructions contain a detailed self-learning contents/course instructions about the topic(s) included in order to satisfy learning objectives. Appropriate feedback is also included for self-assessment of the learner. All these four basic building blocks make an appropriate MIO, which may be synthesized for conformance to standards and technology. Each component of a MIO may be given in the form of multimedia, and may consist of text, audio, video, animation, image, or table, where needed. The proportion of various components depends upon the technology constraints.

