"The evaluation within the development and deployment of IMS LD-based didactic materials: The MD2 + runtime adaptation approach".

Carmen Padrón, Telmo Zarraonandía, Paloma Díaz, Ignacio Aedo

Eighth IEEE International Conference on Advanced Learning Technologies

The evaluation within the development and deployment of IMS LD-based didactic materials: The *MD2 + runtime adaptation* approach

Carmen L. Padrón, Telmo Zarraonandía, Paloma Díaz and Ignacio Aedo
DEI Laboratory. Computer Science Department
Universidad Carlos III de Madrid, Spain
{clpadron, tzarraon, pdp}@inf.uc3m.es, aedo@ia.inf.uc3m.es

Abstract

Evaluation is one of the most important activities in the didactic materials creation since it allows developers to check if the features of created material satisfy all the requirements established at begin of its development and if that material can be an effective support to achieve the educational goals of a particular instructional situation. Its results provide relevant information for the material redesign in such cases when those requirements or educational goals are not satisfied. In this paper we describe an approach to evaluate IMS LD-based materials during their development and deployment in an educational process.

1. Introduction

Evaluation approaches in the e-Learning context are not spare. Many of them had proposed procedures and metrics to assess educational hypermedia applications [2]. They have been applied to asses IMS LD based didactic material in conjunction with the experience provided by LORI [6] in the MD2 development framework [4]. Although the recognized value of evaluation, it has been mostly neglected in approaches dealing with IMS-LD based didactic materials deployment like CopperCore [1] or dotLRN [5]. In this paper we present an approach for the evaluation of didactic materials during their development and as part of their deployment. This approach combines the MD2 development framework with runtime adaptations of the learning design.

2. The proposed approach

Didactic materials are herein considered as we had defined in [4] and the general procedure for evaluation proposed in [2] for the usability evaluation of hypermedia systems has been adapted to assess didactic materials as we had explained in [4]. There is a set of material features needed to check when we are concerned with their evaluation such as if they are reusable, compliant to the e-Learning standards and specifications, and they have an acceptable quality [3]. Thus, the evaluation must be carried out in two stages: the first stage as formative evaluation during materials design and development, where the evaluation objective would be quality. At a second stage, during the deployment, a summative evaluation is carried out in order to assess materials quality, usability, to check the reusable nature of materials and whether the educational objectives had been satisfied.

The following sections describe a framework to organize the procedures for the evaluation of the didactic materials during those two stages, and an approach to support the performance of some of those procedures during the material deployment stage.

2.1 The evaluation in the MD2 development framework

The MD2 development approach supplies an evaluation framework composed by elements from the Usability-Quality (UQ) view of *MD2 model* and evaluation mechanisms described by the 13th step of *MD2 method* [3]. The elements of UQ view provide information about the parameters or criteria and the metrics needed to assess the pedagogical value and usability of the obtained material, which are based on findings of previous evaluation research [3] [6]. They are used as input data to evaluation mechanisms described by 13th step of *MD2 method* [3], which implementation has been represented as "Assessment module" in Figure 1. Those mechanisms process such data based on the difference of what values of UQ elements are observed by evaluators versus their predefined expected values. The results of such comparison will provide developers with reliable information about the pedagogical value/usability of the obtained material. In cases where material lacks of minimum values of quality, those data in form of re-design proposals are notified to developers and can be inserted automatically into the material design using the runtime adaptation approach described in the next section.

978-0-7695-3167-0/08 $25.00 © 2008 IEEE
DOI 10.1109/ICALT.2008.26

2.2 The runtime adaptation approach

In previous papers [7],[8] authors proposed a model, method and mechanism to increase the adaptation capabilities of learning process designs supervised by an instructor and specified by means of an educational modelling language (EML). The core of the proposed solution is the *adaptation pokes*, descriptions of modifications of the elements of a learning design process [8]. The *adaptation pokes* tie together all the changes involved in a particular adaptation and keep that particular concern separated from the main functionality and the rest of adaptations. They can be processed at publication time (i.e. during development), together with the original definition of to the process, as well as applied to running instances during the deployment. This allows the instructor to respond to unforeseen events, modifying the definition of the process and its current state for a particular participant.

A model for the description of the *adaptation pokes* which can be mapped to an XML schema was proposed in [8]. The model was augmented with elements to facilitate the evaluation of the learning objectives as well as the adaptation success. By this way, the instructor is able to describe formulas to measure the objectives satisfaction. If during the process execution the values obtanied for those objectives do not match the expectations, instructor can describe corrective actions using the *adaptation pokes*. The model was extended to include elements to allow the retrieval of information about the state of the process. Using these elements instructors can define *watcher peeks*. The *watcher peeks* can be used to gather information about the process in an analogous way as the *adaptive pokes* are used to modify its definition. The information obtained helps the instructor to identify the causes of problems and to resolve the appropiate adaptive action to take.

The runtime adaptation approach can be combined with the MD2 development framework as it is shown in Figure 1. A runtime engine augmented with the previously mentioned features, as the one presented in [8], would allow using the adaptation pokes and watcher peeks to support the evaluation of a learning design process during its deployment.

By this way the phase of "Performance analysis" can be carried out combining the use of *watcher peeks* with the evaluation elements of the adaptation model. Instructor can be alerted if the data retrieved from the process executions do not fulfill the developers' expectations. Based on that information, re-desing proposals can be generated to improve the original design. Furthermore, the re-designs can be automatically applied by the instructor during the execution to solve the unforeseen problems.

3. Future works

Currently we are involved in the integration of the assessment module of MD2 approach with an adaptative run-time engine to provide developers with an evaluation framework which helps to asses didactic materials not only during their development but also during their deployment in different educational process. The analysis of this framework assessment will helps us to check its effectiveness in real development situations.

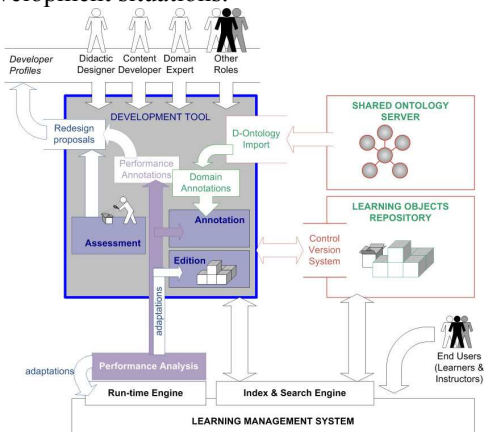

Figure 1. Proposed framework for the didactic material evaluation

Acknowledgements: This paper is part of the MODUWEB project (TIN2006-09678), funded by the Ministry of Science and Technology, Spain

6. References

[1] CopperAuthor project website. Retrieved February 3, 2006 from http://www.copperauthor.org/

[2] Díaz, P. (2003). Usability of hypermedia educational e-books. *D-Lib Magazine*. 9(3). Available at http://www.dlib.org/dlib/march03/diaz/03diaz.html

[3] Padrón, C. L., Díaz, P. and Aedo, I. (2006) MD2 Method: The Didactic Materials Creation from a Model Based Perspective in Innovative Approaches for Learning and Knowledge Sharing. W. Nejdl and K. Tochtermann (Eds.). LNCS 4227, pp. 366 –382, 2006.

[4] Padrón, C. L., Díaz, P. and Aedo, I. (2007). Towards an effective evaluation framework for IMS LD-based didactic materials: Criteria and Measures. In *Procedings of HCI International 2007 (HCII2007)* Volume 4, LNCS_4553, ISBN: 978-3-540-73109-2

[5] dotLRN Retrieved January 2, 2008 from http://dotlrn.org/

[6] Leacock, T. L., & Nesbit, J. C. (2007). A Framework for Evaluating the Quality of Multimedia Learning Resources. Educational Technology & Society, 10 (2), 44-59, 2007

[7] Zarraonandia, T.; Dodero, J. M. y Fernández, C. (2006), Croscutting runtime adaptations of LD execution, *Journal of Educational Technology and Society*, vol. 9.

[8] Zarraonandia, T.; Dodero, J. M.; Fernández, C.; Aedo, I. y Díaz, P. (2007), Computers and Education: E-learning - from theory to practice, cap. 15. Iterative Design of Learning Processes, Springer.