Model Driven Engineering Applied in E-Learning Development Process:
Advanced Comparative Study with ROC Multi-Criteria Analysis

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ABSTRACT

The e-Learning solution is one of the most discussed priorities of modern universities. The whole problem lies in the global approach of which strategy must use to create e-Learning system. This paper describes an evaluation model for some of the existent methodologies based on model driven engineering used to create e-Learning system. The evaluation model is based on a comparative study and multi-criteria analysis: adaptability, transformation process, Bases and standards, Open Distance Learning cycle, model reuse, component reuse, Model Driven Architecture use. The proposed comparative is realized by using the Multi-criteria analysis method: Rank Order Centroid, where we join some of the used characteristics by these methodologies to compare.

KEYWORDS:

INTRODUCTION

The design and implementation of e-Learning platforms is essential for the development and future of information and communication technologies in knowledge management in the teaching/ learning process. Universities and companies require a methodology for developing versatile and flexible e-Learning applications that are, at the same time, capable of storing the large volumes of information required by these educational processes and efficiently conveying this information to their users. However, each year the e-learning's market is in growing development with the new needs (OUBAHSSI et al., 2006). System providers of e-learning must adapt their offerings to the new needs and technological developments. Certainly, the arrival of these tools and training systems online on the training market is accompanied by a variety of proposals to meet specific needs. One consequence of this diversity was the move of the research questions from the field of design of these systems to the analysis of their uses. This research direction has led to several comparative studies (Ecoutin, 2000) which showed that they are developed with different technologies and suffer from a series of deficiencies. Among the deficiencies described in the literature (Oubahssi, 2005) we found that these systems do not cover the full cycle of the ODL (Open distance learning), they adopt their own approach to management training, they offer features that are not interoperable, low flexible and low configurable by users and they suffer from a lack in implemented educational models Studies were conducted to overcome these deficiencies and the results can be organized into two research areas:

- Reengineering of educational and functional needs of existing systems.
- Adaptability, reusability and interoperability of existing systems.

These studies operate on existing platforms (Moodle, Claroline, WebCT...) and proceed by re-engineering process to enhance their capabilities as needed, or implement a new pedagogical approach. Reusability, adaptability of functionality and interoperability are far less discussed topics in the field of CSES, because of their multidisciplinary nature.

In these areas of research two new directions have emerged. The first adopts the component approach to ensure the reuse of business components in other environments (OUBAHSSI et al., 2007). While the second provides craft solutions to enrich the educational model by providing tools for teaching screenwriting based on model driven engineering (Caron, 2006; Laforcade et al., 2007; Caron et al., 2005). These studies led us firstly to see, that researchers still had as target the existing platforms, so specific production environments. Therefore, adaptable solutions to different environmental executions were out of the context of this research. And secondly, to implement these solutions require that the aspects of openness, adaptability, and evolution of applications must be taken into account in the design. Therefore, we must always act on models without forgetting the investment cost caused by the redevelopment and adaptation of existing as well as new business components. So, it's necessary to change the programming methodologies of these environments and adopt model-driven Engineering (Evan, 2003; BLANC, 2005) in the e-learning systems development process.

Our work aims to find solutions of this deficiency. Therefore, we set a goal, the generation of distance learning platforms, which meet all the needs of the area and adapted to different training organizations. The criterion of adaptability will also cover the environment of execution. These platforms will consider all environmental execution and will be generated with minimal cost and time without using conventional practices of software engineering, optimization of resources and efficiency will be respected. It is in this sense that there has been interest to model-based approaches of LMS developments in order to compare and perform a multi-criteria analysis according to business and technological needs. We will start, in this paper, by defining each generation approach apart and the standards on which it is based. Then, we will carry out a comparative study between the different approaches, explaining in detail the advantages and disadvantages of each one of them. Next, we will establish a conformity criteria repository to test the different approaches and develop a multi-criteria analysis between themes. At the end, we summarize the key findings and future work.

COMPARATIVE STUDY OF E-LEARNING APPROACHES

In this section, we will see an advanced comparative study between e-learning systems development methodologies and in particular those based on model driven engineering unique in its kind to date according to the literature. Traditional development methodologies are presented in (Fardoun et al., 2012). We will detail six major approaches: the Model-Based-Instructional Systematic Development Environment (Mb-ISDE) approach, the Model- Driven Architecture Approach for Developing E-Learning Platform (Md-AADEP) approach, the MDA-based framework for building interoperable e-learning platforms (Mb-FBIEP) approach, the MDA-based Development of e-Learning System (Mb-DES) approach, the Model Driven E-learning Platform Integration (Md-EPI) approach and LMSGENERATOR approach. We will see the definition, standards and perform a deep analysis of each approach. We will also see the advantages and disadvantages of each approach.

LMSGENERATOR APPROACH

Definition

LMSGENERATOR approach (Dehbi et al, 2012a; Dehbi et al, 2012b; Dehbi et al, 2013a; Dehbi et al, 2013b) accords with the research ideas on Domain Driven Development (Atkinson et al., 2003; Lafi et al., 2013; Alouini et al., 2013) and on those about models and language for the design and handling of domain reusable components (Crnkovic et al., 2002; Rhanoui et al., 2012; Rouillé et al., 2013). It is mainly based on the ability to define business models that meet the needs of the area, and

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