A study of evaluation papers and surveys about Learning Content Management Systems

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Abstract:
Change appears to be the only constant in the field of ICT and what was treated as advanced feature few years ago is today old-fashioned. If dealing with such rapid change in the field is increasingly difficult and complex, it is even more complicated when one tries to simplify the concepts and processes and define the learning system’s model and the features that would contribute to a more effective teaching. As part of the research team engaged in creating a Learning Content Management System (LCMS) for our university, we wanted to start our project with a comparative study in the field of LCMSs. Lately a lot of research has been done in comparing and evaluating LCMSs. We went through more than 20 research papers which were published in the last decade about this issue, and try to define the demand of key features in a LCMS and the changing scheme of these demands through time. By this we hope we can define present demand and features in order to include them in our future LCMS.

Key-Words: LCMS, VLE, evaluation, e-learning, comparative study, framework

1 Introduction
As part of the research project team, which aims to develop software for Learning Content Management System at SEE University, we primarily had to select the features that would cover our needs and also comply with the actual trends in this area of software development. So, we started our research by identifying the trends and issues in relation to LCMSs and also by exploring the strengths and limitations of online learning management systems. While analyzing and choosing the essential features of the software, we studied and analyzed several research papers that assess and compare different LCMSs or simply indicate the main aspects when developing an LCMS.

Since the papers that we were studying, were written in different time periods, we made an attempt to find the scheme of changing criteria through time. Hence we focused on the aspects that authors found important in their comparative studies about LCMS, how were they compared and evaluated in certain time periods, and what the results of their research were.

Lately attention has been given to standardization (such as SCORM) and Learning Content Management Systems. Paulsen defines an LCMS as follows: “A Learning Content Management System is an environment where developers can create, store, reuse, manage and deliver learning content from a central object repository, usually a database. LCMSs generally work with content that is based on a learning object model” [10].

The limitation of LCMS is in pure focus on learning objects. Ideally, learning objects are learning material that can be used in a wider context. SCORM is a standardization tool regarding content but at the same time a standardization regarding teaching and learning methods is considered necessary. In some communities there is now focus on “blended learning”, that combines online and offline delivery methods in learning programs [5],[6]. Numerous models have also been developed on how to evaluate instructional technology, e.g. the Revised Pedagogical Framework [1]. The main intention of these models is to assess the existing applications and to make it easier for teachers to choose the right application for their students.

The aim of our research was not to find the model or the features of an ideal LCMS, neither then can be a system that would fit to everyone’s needs, but to report on what the researchers from the area of e-learning suggested to be considered when developing or choosing LCMSs. Based on the remarks of this report, we plan to proceed with a
more systematic approach to the software design and development.

2 Methods and framework

As we went through the research papers that compare and evaluate the LCMSs, we noticed that in many papers, only a few aspects are studied. In general, in different papers variety of criteria were considered and the complete research was very helpful in building standards for the right framework, methods and evaluation of the system.

In this section we present some of the methods and frameworks that authors considered important while evaluating LCMSs. Most of these frameworks are based on the frameworks for evaluating computer software and were adopted to meet the LCMS needs [1], [7].

In order to make a distinction between different methods of evaluation virtual learning environments (VLE), in 2003, a simple framework was proposed by Dixon and Baretto [4]. The proposed framework consists of:

- the purpose of evaluation,
- type of evaluating methods,
- applied measures.

It also recommends various evaluation types (summative, formative, integrative), experiments used in evaluation process (case study or test study) and criterion to measure efficiency and usability of VLE method.

Another proposal “Framework for pedagogical evaluation of VLE”, comes in 2004, from Britain and Liber [1]. Britain and Liber amalgamate two models to provide an evaluation framework:

1. The Viable System Model
   The key principle of the Viable System Model (VSM) in relation to LCMSs is that the assortment or options for e-learning provision must be enlarged to match the increasing diversity of students’ requirements.

   The model explores platform criteria from different levels: Program, Module, and Individual. The evaluation criteria consist of: resource management, system flexibility/adaptability, and ability of students to self-organize, monitoring functions, and individualization.

2. Conversational model
   The Conversational model represents a powerful division between basically a one-way transmissions of information compared to the interactivity implicit in a conversation. Because it is far easier, the ‘transmission’ model is usual in present LCMSs. Main issue for evaluation criteria are: presentation, interactivity, flexibility, personalization and communication tools. Workflow actions can be described as follows. However, they do not necessarily occur in a linear fashion – interactive loops or conversations may evolve freely and should be accommodated by the LCMS.

   In 2006, Buendia and Hervas propose a framework which is based on the use of standard specifications that allow instructors the elaboration of benchmarks to evaluate e-learning platforms. The proposed framework is also based on a Learning Platform Evaluation Model that assumes three main areas of functionality of any learning platform: Content, Interaction, and Management [2].

Fig.1 Comparative methods used in studied papers

All the mentioned frameworks and methods were used in evaluating LCMSs. They cover certain areas and author’s opinion about them. Fig. 1 presents the methods used to compare different LCMS platforms.

3 Comparison scheme

In this study we compared more than 20 comparative studies and evaluations of LCMSs, published in the last decade and attempt to conclude if there are some indicators on the comparative aspects and criteria that would explain the current development state of an LCMS.

The comparative studies of LCMS, that actually were the object of our research, were chosen based on their availability on the web and their importance (citations). We went over the main points of each comparative study and presented the results in the Table 1.
Table 1. Scheme of evaluated features in studied papers

<table>
<thead>
<tr>
<th>Main groups of comparisons</th>
<th>Comparative criteria</th>
<th>Year of paper’s publication</th>
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As shown in Table 1, we divided the evaluation criteria in 5 major groups: instructional competence, ease of use, dynamic delivery interface, administrative tools and technical characteristics. According to many evaluating papers that were object of this research, most of these criteria determine the degree to which an LCMS will meet institution's teaching and learning needs.[1],[3],[4].

**Instructional competence** group is about the pedagogical foundation of the system. The LCMS should support successful interactions between students and content as well as among instructors, students and content. Besides this the system should offer extensive support for content management and content delivery.

**Ease of use** is regarding the presentation of learning content. In this group also adaptivity of the system is considered, as the possibility of the system to personalize the learning experience according to the needs of the student.

**Dynamic Delivery Interface** provides user tracking, user tracking links to related sources of information, and supports multiple assessment types with user feedback. This interface may be modified for the institution using the LCMS. For example, content may be presented on Web pages emblazoned with the look and feel designed to reflect the desired corporate image.

**Administrative tools** launch e-learning courses from course catalogs, track and report student progress, and offer other necessary management features as: registration, tracking, curriculum, management and feedback mechanisms.

**Technical characteristics** include features as scalability, security, compatibility and interoperability. The scalability and extensibility refer to the ability of the infrastructure to scale and increment to meet the growth in increased instruction and the student’s quota. The system should comply with open industry standards for Web deployments and support the major learning standards, for instance SCORM, therefore the interoperability feature is also very common in evaluation studies. Security is also included in this category of the system. The system should selectively control access to system assets like content, services, course offerings, learning objects, student records, and so on.

The Table 1. header contains the analyzed papers sorted by year of publication while the first column contains the comparison criteria. If a certain criterion was included in the analyzed paper, the appropriate field is marked.
During this study, we were aware that papers are published at least one year later than the actual time when the comparison took place, but we consider that this won’t have any impact in the overall picture of LCMS development.

4 Results
The research done on comparison and evaluation of LCMSs, lead us to the following conclusions.

In earlier evaluations, authors used criteria and features that were not present in later evaluations like integration of CD material and online content, batch student and courses input, application sharing and search possibility. Some of these features were substituted with other ones. Actually LCMS integration with other systems like registration information system, student information system, roster and other applications that contain data about students and courses replaced the need for manually inserting students and courses into an LCMS.

In present research very often new trendy features are evaluated [9]. Some of them are blogs, social networking, and discussion forums. The impression is that social phenomena are very smoothly adopted in education and arranged to educational needs.

Adaptation is also a new feature that is considered in the later research, and it was not present in the past [8]. Multiple paths surveys can be the beginning of adaptation based on users activities. This can be a very useful feature in future LCMSs.

As far as the methodology and frameworks are concerned, the main message that can be gleaned from the research done is that technology should adapt to fit pedagogy not the other way around. Educational institutions need more flexibility and control over their e-learning environments to enable different groups of users (teachers, students, administrators, etc) to select and deploy the most appropriate e-learning tools. Interoperability standards and modular, extendable architectures hold the promise of delivering the desired flexibility and ensuring greater future proofing in a technology environment that is fast evolving. By enabling configuration at multiple levels, alternative visualizations of what a VLE should be like, can be accommodated. There is a strong link between the way that a VLE is designed and the way that it is typically used.

5 Conclusions and further work
Although the number of papers that we studied is only a part of the comparative study about LCMSs, we consider that this research, gave us an idea about the current trends in this area. It seems that most of the features that were considered as important and significant in the past are part of the default features in current LCMSs. If this tendency will continue, probably new features will be added to support teaching and learning, and the system designers must plan the possibility of upgrading the system with new features.

In further work we plan to continue with the following software development phases and at the same time to test and evaluate the LCMS from the perspective of integration with other e-systems at the university.

References:
