

Designing third-generation web-based systems for distance learning: influence and contributions from Open Source

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Abstract: - In this paper we explore current trends in distance learning web-based systems as a response to new e-learning models. We also analyse how the Open Source community and its tools have influenced in the evolution of distance educational technologies and methodologies.

Key-Words: - Distance learning, Evolutionary contents, Collaborative technologies, Open technologies, Customization, Learning web services

1 Introduction

Providing flexible education for everyone, everywhere, has been one of the fundamental goals of distance learning. While traditional (i.e. pre-Internet) distance learning methods and materials have been around for many years, we're experiencing an increasingly high switch to Internet-based course systems, with virtually every University offering on-line courses or degrees.

Why?. The worldwide adoption of the Internet as a new medium and the rapid evolution of web-based systems and tools are providing new approaches towards solving some fundamental problems of traditional distance learning: mainly isolation and the lack of knowledge construction in a social way as it occurs in the classroom.

We can speak about two past generations of e-learning web-based systems—with limited success in those areas—and the advent of a promising third generation, where Open Source is playing an increasingly important role.

The interesting fact about this emerging generation is that Open Source is not only contributing with its products but especially with its process: the process of being part of a community, where all members listen to each other and collaborate towards the construction of an abstraction [1].

This fits well with the idea of some learning theories (mainly constructivism) and has been reflected as such in the rapid success of some Open Source tools which open the path that distance

learning methodologies had been waiting for [2].

Methodologies based on collaborative working and tutorial action are being experimented with good expectations [3].

2 The past: a quick review to web-based learning systems

2.1 First and second generations

First-generation web-based learning systems efforts were oriented towards one direction: to move course contents to each student's location, as well as providing contents and limited tools for feedback.

Teachers using web-based learning environments began to use on-line facilities to provide learners with access to existing course materials re-packaged for web delivery. That meant that on-line courses were implemented as direct analogues of conventionally-delivered courses.

This first generation of on-line courses didn't obtain the same results as the original courses: the most visible consequences were that very few students used the course (disengaging environment) and, when they did, they used the system as a comfortable way to obtain materials from an electronic repository (passive environment).

Second-generation on-line courses tried to go a step further by taking into account the different participants of the classroom, but seemed to be centred in the work of the teacher, giving less attention to tools and software supporting interaction and collaboration from a learner-centred perspective. Again, the main consequence was most

Also known as Course Management Systems (CMS) or Learning Management Systems (LMS).

of the students leaving the course. The teacher feels the need to play a new role and the student feels alone without the support of a peer group (moderated on-line discussion, peer exchange, etc.).

We can conclude that the main achievements of these generations of distance learning systems were:

1. To make contents available to everyone.
2. To provide a mean of communication between the student and the teacher.
3. To establish a central point of reference for everyone involved in the course.

But the obtained results were not as promising as expected.

2.2 Flaws and pitfalls of the first systems

Years of use of this kind of systems have shown some flaws and pitfalls:

1. Contents were long, static and rarely reviewed or updated. This meant nothing but an electronic version of books and other printed material, with the inconvenience of having to print it or read it on the screen.
2. All contents were shown from the beginning. Too many materials were presented in the same way from the beginning of the course, discouraging the student to read such a huge amount of pages.
3. The course was not socially adapted to the new medium. It didn't include or substitute the social components of a classroom, nor it was adapted to each student's particular needs [4].

These flaws and pitfalls led to some unavoidable consequences:

1. The student felt isolated and didn't form part of a community, thus missing all the social aspects of learning.
2. Teachers realized that traditional methodologies didn't provide the same good results in web-learning systems as they did in a conventional classroom.
3. Technology and web-based systems proved to be insufficient to meet the demands of the learning community.
4. E-learning as a whole became relegated to a second plane.

So we can say that flaws came from methodology as well as from technology, not having interacted in the expected manner.

3 The future: emerging methodologies and tools

3.1 New e-learning models

Third-generation systems are coming and new e-learning challenges demand new models, taking some measures that previous models had dismissed.

1. **Learner.** Both the individual and social dimension of the learner must be taken into account. Objectives are still important and should be individual and flexible, but also materials and information exchange, as well as the development of cooperative learning abilities.
2. **Teacher.** The role of the teacher is now to be the creator of digital learning objects, the facilitator of access to useful digital knowledge resources and the tutor of the students of an on-line course.
3. **Contents.** Technology should be able to manage the evolutionary and collaborative nature of contents, tracking authorship and versioning.

Current trends show that in the forthcoming years new e-learning web-based systems will appear based on different methodologies than today. We find a very important tendency towards customized Open Source systems, according to cooperative learning methodologies oriented towards personalization learning [5].

Observed changes in the formative process focus respond mainly to the following reasons:

1. People with different characteristics learn differently.
2. Learning is a contextual phenomenon.
3. The student learns and acquires knowledge as he gets involved in his own learning process.
4. The learning environment plays a fundamental role.
5. People develop different learning styles depending on time and context where they learn.
6. The learning strategy changes for the same individual depending on the subject learnt.

Providing the teacher with a set of tools which automatize the technological support of distance learning is a long and complex process if we aspire to add the variables which intervene in the personal learning process and if we desire to achieve it with proved security and quality [6], [7].

Several studies suggest that a 1% increment in

knowledge (contents, abilities...) also increments productivity between a 0.05% and a 0.25% in the long term [8]. This fact is enough to make an important effort to design, build and monitor adaptive distance learning services for individuals and groups in a way they become real commodities and increase the performance, making the learning process stimulant and rewarding [9].

For that reason, there's a need to analyse, compare, elaborate and quantify the costs of this methodologies and derived web services [10].

One of the aspects that should be especially taken with care is the tutorial function [11]. Educators must receive appropriate training in innovative educational methods, that is, in new technologies, student-teacher interactivity and a correct team working.

Cooperative methodology will provide a participative and close-to-reality evolution to learning reality and will encourage multidisciplinary team working.

3.2 Open Source contributions

Among the most interesting tools which have greatly influenced third-generation web-based learning systems, we may mention the following:

1. **Wiki.** Originally "WikiWikiWeb", by Howard G. Cunningham and written in the Perl programming language, it allows collaborative web-page editing, storing and tracking every change made [12].
2. **Version control.** Derived from the original RCS (Revision Control System) by Walter F. Tichy, Open Source Tools such as CVS (Concurrent Version System) and SVN (Subversion) serve as a neutral-file-format content repository with the same properties as a wiki, thus encouraging the evolution and updating of all kinds of contents [13].
3. **Weblogs and syndication.** The unprecedented popularity of weblogs comes to confirm the importance of the individuals in constructing knowledge, where syndication has provided the way to link and select that information [14].

All these tools, although originally created with other purposes in mind, greatly contribute to solve some of the problems described and are becoming the de facto standard in collaborative working and social knowledge construction [15].

It is no wonder that the main tools for third-generation web-based learning systems come from the Open Source community, as collaborative

construction is in its very nature.

But the contribution of Open Source is not limited to the technology. The methodology applied in OSS development—keeping a horizontal hierarchy, evolving the role of the project manager to a coordinator of efforts and moving the initiative to the community—is similar to the fundamentals of new e-learning systems, which rely on the open participation of the students and the coordination of a tutor.

In few words, it shifts the process of learning from a teacher-centred structure to a distributed process, where the source of knowledge construction, and hence of learning, is actually open.

4 Conclusion

Moving a learning environment from the classroom to the web has proved to be much more complex than moving learning contents to a website and providing a mean to communicate with the teacher.

After two generations of e-learning web-based systems with limited success—compared to promised expectations—, lessons have been learnt about teacher and student's needs in a new medium.

Among this lessons we find the necessity of adopting new distance-learning teaching methodologies, embracing technology and its benefits, but bringing back the importance of the community as the source and constructor of knowledge [16].

These are the premises with which third-generation web-based learning systems are being designed and constructed, with the aid of Open Source tools and techniques.

Popular Course Management Systems such as Moodle or projects such as e-LKG[10], DSED[17], Edukalibre[18] and others are the proof of fact and the scaffold of the third-generation systems that are to come.

5 Acknowledgments

The authors want to acknowledge Ministerio de Educación y Ciencia, Spain for grant TSI2005-04127 supporting their research.

We'd also like to mention the collaboration of Ángel Fidalgo, Dana Bauerova, Jesús González Barahona, Séraphin Alava and José Jorge Gil, which allowed us to deeply study DSED, MOODLE, EDUKALIBRE, GALATEA and gave us their vision of technology as a mean to serve people.

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