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Perceived openness of Learning Management Systems by students and teachers in education and technology courses

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ABSTRACT

The emergence of Information and Communication Technologies (ICTs) make new tools available for users to manage information and knowledge. These tools are used in different contexts, with varying degrees of success. One of these potential application contexts are teaching and learning processes supported by learning platforms. Learning platforms are a way for institutions to provide teachers and learners with a wide range of educational applications and services. However, students' learning is not only limited to a specific institution or period of time; instead, learning is a lifelong process and encompasses the use of many different tools. Therefore institutional learning environments should be open in order to enable the export of functionalities and import of information and interaction from outside the institution. In order to do so, this study proposes a service-based framework, which uses interoperability specifications and web services to facilitate opening of the institutional learning systems. Such framework has been tested in educational and technical scenarios with similar results, learning platforms can be open and the exportation of functionalities from them to personal contexts can enrich students learning and increase their participation.

1. Introduction

The application of Information and Communications Technologies (ICTs), and specially Internet, in teaching and learning contexts is a revolution in the way in which these processes are carried out, especially with the emergence of Internet, the introduction of e-learning concept, the proliferation of Learning Managements Systems (LMSs) and the definition of contents adapted to these new contexts (García-Peñalvo, 2005).

However, while ICTs represent an important advance in many contexts – e.g., the rise of mobile 'apps', technology by itself does not always guarantee success in learning processes (Webb, 2009). This may happen mainly due to four reasons: (1) Institutional resistance to change, resulting in opposition to the introduction of certain technologies in formal environments (Mott & Wiley, 2009); (2) persisting on application of technologies in scenarios where it is not required nor a valid solution (Chadwick, 2001); (3) the need for digital literacy amongst teachers and students, many of whom are digital immigrants, while younger students are digital natives (Prensky, 2001); (4) and last, but not least, the fact that many technological applications and tools are designed and developed without final users in mind, which turns their adoption and use into a difficult task (Downes, 2005).

Therefore, a divergence is observed in the technologies that the learners use to learn in non-formal environments and those provided by educational institutions, and two kinds of learning environments are needed: institutional and personal.

The institutional environment is represented by the LMS. These environments are focused on course delivery and provide teachers with tools which not only support but also extend the traditional concept of classroom and facilitate managerial tasks (Avgeriou, Papasalouros, Retalis, & Skordalakis, 2003). These systems also provide students with spaces in which they may perform their academic activities, complement their lectures and, to a greater or lesser extent, collaborate with other students and teachers. LMS have become very popular both in academic (Prendes, 2009) and professional environments (Wexler et al., 2008). Nevertheless, they do not address the issues previously described (Brown & Adler, 2008) because: (1) they are not focused on the learner but rather on the institution and the course (Attwell, 2007b); (2) they do not support lifelong learning (Attwell, 2007a); and (3) they do not support the integration of new technological trends such us 2.0 web tools and other new technologies (Ajjan & Hartshorne, 2008), and they hardly evolve (Mott & Wiley, 2009).

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Because of this students are reluctant to use these learning platforms exclusively. They need learning environments which are better adapted to their needs, open to the integration with any innovative technology and which facilitate the integration of the tools they use to learn. That is, learning environments more focused on students and their lifelong learning (Attwell, 2007b).

This kind of environments are the Personal Learning Environments (PLEs) (Wilson et al., 2007). PLEs facilitate the creation of spaces in which the learner can include the tools he/she uses to learn and without the need to establish a direct link with an institution or an specific period of time (Adell & Castañeda, 2010). With PLEs, learners become more responsible of their learning because they can decide what tools to use, they become a provider of learning and not only a consumer, they can solve their specific problems, etc. (Adell & Castañeda, 2010; Schaffert & Hilzensauer, 2008).

Both types of environments may coexist because they support two different concepts of learning and also because Institutions have already invested great amounts of money and time in the deployment of LMS and have earned a lot of experience in their use. This means that students and teachers have to access two different learning environments, but then what happens in the personal environments should be taken into account from the institutional side. Given this situation both environments should be able to interoperate that is, to exchange information and interaction between them.

The present paper describes how to open the LMS both to export of functionalities to other environments such as PLEs, and to the integration in the LMS of learners' outcomes from activities performed outside the institution. More specifically a service-based framework developed for this purpose and its application to educational and technological areas are presented.

In order achieve this goal this paper is structured as follows. Section 2 describes the background for the experiment, with special attention to existing initiatives for opening of LMS and to the description of the service-based framework used for the empirical study. Materials and methods are detailed in Section 3. Section 4 presents the results and discussion of findings from the study, distinguishing and comparing the results found in educational and technological areas. Finally, conclusions for the study are posed.

2. Background of the experiment

This section starts with a review of some of the existing initiatives for opening of LMS and their integration with other contexts; then, a specific service-based framework solution to achieve this goal is proposed.

2.1. Integration initiatives

It is not an easy task to open LMS to other contexts, and neither is the integration between a PLE and a particular LMS. There may have different reasons for this, such as (Palmér, Sire, Bogdanov, Gillet, & Wild, 2009; Sclater, 2008; Severance, Hardin, & Whyte, 2008; Casquero et al., 2008): (1) LMS do not normally include interoperability standards; (2) the integration of training activities in the PLE is not satisfactory because they are designed for representation, classification and tracking in other platforms; (3) problems derived from user activity traceability in the PLE and, therefore, also in the formal environment; (4) single-sign-on implementation problems; (5) information security issues.

In order to facilitate this kind of integration, Wilson, Sharples, and Griffiths (2008) propose three interoperability scenarios.

1. PLEs and LMS could exist in parallel, as formal and informal environments respectively, without any interaction or integration of the activity that happens in those contexts.
2. LMS could be opened up through the inclusion of web services and interoperability initiatives. This integration trend includes *iGoogle* based initiatives (2008); social networks connected with LMS (Torres, Edirisingha, & Mobbs, 2008); LMS offering support for implementation of interoperability specifications (IMS-GLC., 2011); PLEs with specific communication protocols (van Harmelen, 2006); or integration based on service-oriented architectures (SOAs) (Peret, Leroy, & Leprêtre, 2010). The main difficulties for the success of these initiatives include institutional barriers to the opening of formal environments and the fact that those initiatives are focused on information export and not on interaction exchange. That is to say, communication is unidirectional, from the LMS towards the external tools; basically this communication consists on the exchange of information about what happens on the platform, providing no interaction or information back to the LMS.
3. External tools could be integrated into the LMS. In these initiatives, the user might not decide which tools she is going to use and the final decision about authorized tools would fall exclusively on the institution. Some initiatives that can be included in this group are: LMS defined for the integration of external tools (Booth & Clark, 2009); *Google Wave* Gadgets integrated into *Moodle* (Wilson, Sharples, Griffiths, & Popat, 2009); initiatives based on tool integration driven by learning design activities (de-la-Fuente-Valentín, Leony, Pardo, & Kloos, 2008); PLE based on the inclusion of tools depending on log analysis (Verpoorten, Glahn, Kravcik, Ternier, & Specht, 2009); or integration architectures (Alario-Hoyos & Wilson, 2010). These initiatives present different problems, such as those derived from integration between tools or contexts, and rigid configurations impeding customization by students. At the present time, those initiatives that define a learning platform starting from scratch or from a previous institutional development have been the ones most able to overcome these problems. This greatly limits the scope of use of a solution, which is intended to be applied to very specific contexts, and presents other problems such as the lack of adoption and the necessity of learning to use a new software (Alario-Hoyos et al., 2010).

Taking all these solutions into account, it can be concluded that the integration between LMS and PLEs is still far from being achieved. The use of web services and interoperability specifications facilitates the opening up of LMS, but they are very difficult to implement. Therefore there is an actual need for the definition of a service-based framework facilitating export of functionalities outside of the institutional platform and the integration of learners' outcomes from external tools in the LMS.

2.2. A Service-based framework for opening of the LMS

Two relevant issues have been raised in the introductory section of this paper: the need to facilitate the export of functionalities from the LMS to other contexts and the need to track record in the institutional environment from activities carried out in such contexts. In order to address both, a service-based framework has been defined (García-Peñalvo, Conde, Alier, & Casany, 2011). This framework uses interoperability specifications to facilitate communication between the institutional environments and the PLEs; this communication is based on the exchange of interaction and information between both contexts. In this way, this solution goes beyond other existing initiatives because it allows more complete and bidirectional communication among the LMS and the PLE. Fig. 1 shows how such an architecture is deployed.

The architecture includes several nodes representing the institutional and personal contexts. Such nodes include different components which will be described next.