



**VNiVERSIDAD
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Departamento de Informática y Automática

**Personalización del aprendizaje:
Framework de servicios para la
integración de aplicaciones *online* en
los sistemas de gestión del aprendizaje**

TESIS DOCTORAL - RESUMEN

Doctorando
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Resumen

Las Tecnologías de la Información y la Comunicación (TIC) aplicadas a los procesos educativos (*eLearning*) inducen transformaciones que afectan tanto al modo en que se aprende como a las competencias digitales e informacionales que docentes y discentes tienen que adquirir. Aparecen diferentes herramientas *software* para la gestión y el desarrollo de actividades de aprendizaje. La denominada Web 2.0 introduce un conjunto de prácticas que suponen un giro hacia el usuario, que deja de ser un mero consumidor de contenidos y pasa a participar en la creación de la propia Web mediante la colaboración con sus pares. Esta tendencia aplicada al *eLearning* permite llevar a la práctica el paradigma de aprendizaje centrado en el estudiante, donde el discente pasa a tener un rol más central y protagonista en su formación. Se capacita al estudiante para guiar su aprendizaje y facilitar el aprendizaje de otros, lo que le confiere un rol más activo y protagonista.

Gracias a la aplicación de las TIC y las herramientas web 2.0, los canales de comunicación e intercambio de información se potencian, lo que facilita que se haga visible el aprendizaje informal. Este tipo de aprendizaje puede utilizarse como complemento a experiencias educativas más propias de la formación reglada y el aprendizaje no formal, asociado tradicionalmente a la formación continuada en el ámbito laboral, de forma que se enfatiza el aprendizaje a lo largo de la vida.

En esta situación se plantean varios problemas: la diversidad de tecnologías y herramientas que se utilizan en los contextos formativos supone que el estudiante tenga que utilizar muchas de ellas durante su formación, lo que puede desorientarle; debe considerarse que el aprendizaje no se limita únicamente a ámbitos educativos formales, el estudiante también aprende a lo largo de su vida en diversas situaciones; los docentes están condicionados por los contextos institucionales respecto a las herramientas con las que llevar a cabo actividades educativas; y, a pesar de la existencia de nuevas soluciones, su incorporación a los ámbitos institucionales es compleja, ya que dichos ámbitos evolucionan lentamente.

Buena parte de estos problemas quedan reflejados en las soluciones tecnológicas por excelencia que son las plataformas de aprendizaje (*Learning Management Systems* o LMS), entornos que: 1) Satisfacen los requisitos de gestión del aprendizaje de las instituciones; 2) Proporcionan a los profesores un conjunto de herramientas para gestionar los cursos, estudiantes, recursos, actividades, etc.; y 3) Suponen para los estudiantes un punto de encuentro y soporte para el seguimiento de la clase, y (en mayor o menor medida) de interacción y colaboración con otros discentes y docentes.

Estos LMS se centran en el curso, con lo que encajan con un modelo educativo basado en la clase en la que el profesor imparte unos contenidos, establecidos por un plan de estudios, a un conjunto de estudiantes, con un nivel y un ritmo de aprendizaje artificialmente uniformes. Pese a que muchos profesores sacan provecho de las posibilidades que ofrecen los LMS para ir más allá de dicho modelo, el esquema curso-profesor-clase siempre está presente en el LMS. Ante esta situación, los estudiantes necesitan otro tipo de entorno de aprendizaje que realmente satisfaga sus necesidades, les permita emplear las herramientas y servicios de aprendizaje que consideren oportunos para su formación, refleje lo que aprenden en su día a día y en el que ellos sean los últimos responsables de su formación. Este espectro tecnológico lo cubren los entornos personalizados de aprendizaje (*Personal Learning Environments*, o PLE). Los PLE no pretenden reemplazar a los LMS porque: 1) Ambos entornos dan soporte a concepciones diferentes del aprendizaje (los LMS al aprendizaje formal mientras que los PLE están más orientados a contextos informales); y 2) Los LMS tienen una gran aceptación, especialmente en el ámbito institucional, han sido utilizados durante varios años y están bien probados, tanto profesores como estudiantes están acostumbrados a su uso y las instituciones han realizado grandes inversiones en ellos. Esto supone que ambos entornos deben coexistir.

Dado este contexto, es un requisito necesario que los entornos que soportan el aprendizaje formal (LMS) y aquellos que se orientan más hacia un contexto de aprendizaje informal (PLE) tengan un cierto grado, cuanto más alto mejor, de integración e interoperabilidad. Así, sería deseable que los entornos formales pudieran exportar funcionalidades a entornos informales y, en contrapartida, la actividad que ocurre en los entornos informales pudiera reflejarse en las plataformas de gestión del aprendizaje propias de las instituciones.

Para intentar aportar una solución a este problema de interconexión e interoperabilidad de dos mundos tan diferentes, pero a la vez tan relacionados, este trabajo de tesis doctoral propone un *framework* de servicios de interoperabilidad entre los contextos institucionales y los entornos personalizados de aprendizaje o PLE. Dicho *framework* tiene una estructura básica, formada por una serie de componentes, servicios e interfaces, que facilita el intercambio de interacción e información entre estos dos contextos educativos con dos formas muy diferentes de entender las actividades de aprendizaje. Por esta razón, el *framework* se completa con un conjunto básico de escenarios de interoperabilidad entre ambos mundos. Se modelan así los patrones más comunes de interacción entre ellos. En concreto, es necesario tener en

cuenta: 1) La posibilidad de exportar información y funcionalidad de los entornos institucionales a los PLE; y 2) La posibilidad de integrar en la gestión institucional del aprendizaje (y, por tanto, del conocimiento) la actividad educativa de los discentes desarrollada en herramientas *online* externas a estas plataformas institucionales y, por ende, orientadas hacia un enfoque educativo formalizado. La aproximación tecnológica que soporta esta propuesta se basa en el uso de especificaciones de interoperabilidad y de servicios web, lo que redundará en una solución abierta a la incorporación de cualquier herramienta, flexible para soportar los cambios tecnológicos y portable para su uso en otros dispositivos. El *framework* se implementa mediante una prueba de concepto que ha servido para su validación en contextos reales.

Las experiencias piloto que se han desarrollado para validar la solución propuesta permiten afirmar, como conclusión más general, que la interoperabilidad entre los entornos tecnológicos que soportan el aprendizaje formal e informal es posible. Interoperabilidad que puede facilitar el aprendizaje del estudiante (que no necesita acceder a diferentes contextos), aporta a la institución información adicional de qué hace el estudiante en los entornos informales, amplía el conjunto de herramientas de las que dispone el profesor para realizar actividades formativas y permite que los entornos formales puedan utilizarse desde otros canales y dispositivos. En definitiva, la interoperabilidad provoca una apertura de las plataformas tecnológicas de gestión del aprendizaje y, por tanto, su evolución necesaria y consecuente con el avance tecnológico, la demanda y uso social de la tecnología aplicada en los procesos de enseñanza/aprendizaje.

Palabras clave: *Framework*, Servicios, Interoperabilidad, Plataforma de Aprendizaje, LMS, Entorno Personalizado de Aprendizaje, PLE, Aprendizaje Formal, Aprendizaje Informal.

Abstract

eLearning, Information and Communication Technologies (ICT) applied to education, causes changes that affect the way in which people learn and the (digital) skills set learners (and teachers) should achieve. Nowadays there are different kinds of software (online) tools for managing and developing learning activities, these tools have achieved a considerable level of maturity and adoption.

The Web 2.0 introduces a set of practices involving a shift to the user, who is no longer a content consumer and has the chance to participate in the creation of the Web, in collaboration with peers. This 2.0 trend applied to eLearning enables an online implementation of the student-centred learning paradigm, where the learner happens to have a more central role in her training. It enables the student to control her learning and help other students to learn.

In addition, through the application of ICT and web 2.0 tools, communication and channels for the exchange of information are enhanced, making it easier for informal learning to become patent. This kind of learning experiences can be used to supplement formal learning (related with the educational institutions) and non-formal learning (traditionally associated to workplace training), favouring lifelong learning.

In this situation, several problems arise: in the first place, the diversity of technologies and tools used in learning contexts force students to use many different of them during their training, and this may cause disorientation in students; secondly, we should not regard at learning as limited to formal learning environments, since people also learn throughout their life in different informal contexts (lifelong learning); third, teachers and instructors are usually constrained by their institution when it comes to the use of specific set of tools for learning activities; and finally, despite the emergence of new solutions designed for learning, their inclusion in institutional learning environments is something complex due to the slow evolution of such environments.

Many of these problems are reflected in technological solutions such as Learning Management Systems (LMS). These are systems that: 1) fulfil institutional learning management requirements; 2) provide teachers and academic staff with tools for the management of courses, students, resources, activities, etc.; and 3) they create specific areas for students in which they may perform their academic activities, supplement their lectures and (to a greater or lesser extent) collaborate with other students and teachers. These systems are focused on the course and provide with tools which not only support but also extend the traditional concept of classroom, where the teacher gives a lecture and presents some contents (which are previously

set out in a study plan) to the students, with a level and pace of learning artificially uniform. Although many teachers take advantage of the possibilities offered by the LMS to go beyond this pattern, the teacher-class-course model is always present in the LMS. In such situation students have need of other type of learning environments, which may completely fulfil their needs and allow them to use learning tools and services of their choice, show what they really learn in their daily lives, and in which they are fully responsible for their learning processes. Personal Learning Environments (PLE) address all these requirements; PLE are not a replacement for LMS because: 1) both environments support different kind of learning (LMS support formal learning while the PLE are more oriented to informal contexts); and 2) LMS have a high acceptance (especially in institutional environments), have been used during several years and are strongly tested, both teachers and students are used to using them, and institutions have made a great investment for their implementation, improvement and adaptation. All this means leads that both environments should coexist. Given this context, it is necessary that the environments which support formal learning (LMS) and those related with informal learning (PLE), have a certain degree, the higher the better, of integration and interoperability. In this way formal environments can export functionalities to the informal ones and the activity that is carried out in informal environments can be taken into account into the institutional learning platforms.

Given this context, it is necessary that the environments which support formal learning (LMS) and those related with informal learning (PLE), have a certain degree (the higher the better) of integration and interoperability. Thus, formal environments may export functionalities to the informal systems, and the activities, which take place in informal environments, may be accounted for in the institutional learning platforms.

In order to provide a solution to the interconnection and interoperability between so different (yet related) worlds, this PhD work proposes a service-based framework to enable and facilitate interoperability between institutional and personal learning environments. Such framework consists of a set of components, services and interfaces which facilitate the interaction and exchange of information between these two educational contexts. Since both perspectives should be considered, the framework is completed by a basic set of interoperability scenarios between these two worlds. With this course of action it will possible to describe the most common interaction patterns. More specifically, it is necessary to consider: 1) the possibility to export information and functionalities from the institutional environments to the PLEs; 2) the possibility to integrate the learners' activity which takes place in the external online tools with the institutional learning management systems. The technological

approach to support this proposal is based on the use of specifications for interoperability and web services, resulting in an open solution able to incorporate any tool, flexible enough to adapt to technological changes and portable for use on other devices. The framework is implemented as a proof of concept in order to validate it in real contexts.

Through the pilot experiences conducted to validate the solution it is possible to conclude that the achievement of full interoperability between the informal and formal learning environments is possible. Such interoperability helps students in their learning process (because they do not need to access to different contexts), provides additional information to the institution about what the student does in informal environments, expands the set of tools available for the teacher to design learning activities and allows using formal environments in other channels and devices. In short, interoperability leads to opening the learning management systems, and therefore their evolution, something necessary and consistent with the technological advances, users' demands and social use of the technology involved in teaching and learning processes.

Keywords: Framework, Services, Interoperability, Learning Platform, LMS, Personal Learning Environment, PLE, Formal Learning, Informal Learning.

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