

Changing Technological Infrastructure and Services in Higher Education: Towards a student-centred approach

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1. Student-centred approach

Since 1999 we have experienced an increasing use of ICT in higher education institutions (HE). Such deployment covers administrative and management tasks and the teaching and learning processes as such.

The basic idea fostered by most reports (DFEE-UK, 1998; Bricall 2000; eLearningPR, 2004-06) is that an increasing use of ICT at HE should take into account individual needs and learning-styles, and that they should not be based on a "one size fits all" philosophy, in which learners are seen as standardised "units" (eLearningPR, 2004-06).

This "student-centred approach" poses many technological, pedagogical and organisational issues. As far as technology is concerned the main goal is to provide a more integrated provision of ICT services. This objective is quite relevant considering both, the increasing number and variety of services that could cause problems of usability and accessibility, and the interoperability required to provide many functionalities.

Nowadays we could claim that, thanks to the pervasive use of ICT, we are starting to overcome what we could call "the first layer of ICT services" (i.e., management and administrative tasks, which include enrolment procedures, management of examinations, delivery of materials, access to consultancy and teaching services, etc.). The current challenge is to cope with the teaching and learning processes in themselves, those to be included in the "second layer of ICT services". To this it is generally accepted the idea that eLearning present valuable features. Nevertheless, current commercial Learning Management Systems (WebCT, Blackboard, TopClass, Ingenium, Docent etc.) hardly offer any information about which didactical methods and models they use, nor is it possible to explicitly express them. Moreover, as far as adaptation is concerned, they just offer predefined settings that require extensive customisation.

It is evident that learning, teaching and managing issues at HE are far more complex than those presented in a particular setting within an online course. For instance, this "student-centred approach" is inappropriate for an increasing number of students, who are supposed to be benefited from this paradigm, but in fact have to face social, physical and cognitive barriers because they have special needs and do not meet "standard ways of doing things". This issue is palpable for those involved in providing assistance to learners with special needs in educational institutions, where the mere lack of information or access to pre-established procedures, not to mention the difficulties in providing the required infrastructure, may become insurmountable barriers for students interested in making this paradigm come true.

Moreover, if the purpose is to support the Lifelong Learning (LLL) paradigm, which considers the idea that learning should occur throughout a person's lifetime, students are to be equipped, following a student-centred approach, with the attitudes and skills to learn for themselves.

On the other hand, the authoring of learning materials should take into account individual needs and preferences, and both of them evolve even within a particular online course, not to mention in a LLL paradigm. Furthermore, faculty staff should be trained to cope with these types of problems, and there are few experiences in providing personalised education at large scale.

Considering this situation, the Innovation and Technological Vice-principal office¹, which is in charge of promoting and managing ICT services at UNED, is working on several technological and management issues. The main purpose is to provide an integrated and personalised access to available services, including adaptive course delivery in LMS.

2. ICT services and personalised learning

UNED is providing ICT services for over 170.000 students, 1200 faculty staff, 5000 tutors, 1200 administrative people and 120 study centres. In particular, we are aiming at providing integrated and personalised scenarios where user needs and preferences, including design for all issues (Velasco *et al.*, 2004), are properly addressed (Boticario *et al.*, 2005).

As far as technological infrastructure is concerned we provide the integration of available services via a standardised authorisation of applications. This integration supports interoperability of applications that cover management of users (faculty staff, students, tutors, and administrative people), contents of varied nature (exams, study guides, calendars, bibliographic resources, videos, audios, etc.) and communication channels and means (e-mail, forums, news, radio, educational TV, IP telephone access, etc.). In addition, the network infrastructure is being extended with the intention to provide Gygabyte's facilities and full coverage of wireless access, including UNED's headquarters and study centres. Moreover, an intelligent card will be deployed, which integrates digital signature and radio frequency identification (RFID) to improve safety procedures to control the access to examination halls and secure sensitive applications.

Regarding teaching and learning processes our goals are twofold. Firstly, to provide effective pedagogical approaches which takes into account more than five years of experience in delivering online courses for over 140.000 students per year. In this respect, we support a task based learning approach, where students no longer deal with the question and answer model and loosely coupled contents. Moreover, the innovation department has developed a dynamic web framework called aLF². Based on four years' experience with more than thirty-five thousand eLearning users (Boticario *et al.*, 2004), aLF provides a new set of tools for supporting courses and collaboration communities of varied nature (departments, faculties, administrative units, research projects, users' groups, study communities, etc.). This LMS, whose last version is built on top of the dotLRN open source platform, has evolve over the last four years to integrate eLearning and collaboration utilities with the rest of the ICT services provided at UNED.

Furthermore, to facilitate the management of online courses we have set up a Support Unit for Development of Courses and Projects (USO-PC³). This Unit has been established to guarantee a centralised control of faculty staff requests regarding course developments and projects. The intention here is not just to offer available resources and assistance to course contents' authors, multimedia developments, videoconference services and pedagogical guidance, but also to guarantee the quality of products and provided services (i.e., response time, guidance effectiveness, quality of assistance, etc.).

Secondly, to provide adaptive eLearning, a standard-based LMS has been developed and evaluated in the aLFanet⁴ project (IST-2001-33288). The main feature is to provide adaptive course delivery based on pervasive use of standards (IMS-LD, IMS-CP, IEEE-LOM, IMS-LIP, IMS-QTI) and several user modelling techniques (that combine knowledge-based methods and machine learning techniques in a multi-agent architecture) (Santos *et al.*, 2004). The objective here is not

¹ <http://vicetec.uned.es/>

² <http://www.innova.uned.es/>

³ <http://vicetec.uned.es:8090/webuso/unidades/uso/>

⁴ <http://alfanet.ia.uned.es/alfanet/>

just to facilitate the implementation of courses based on explicit didactical methods (i.e., instructional design, IMS-LD⁵) but also to face the entire life-cycle (i.e., design, administration, use and feedback) as a continuous process which has to be “learner driven” and, accordingly, based on adaptations (Rosmalen & Boticario, 2005).

Adaptation in aLFanet comes from the combination of advanced learning methods specified at design-time, in terms of IMS-LD, and adaptive interaction supported at runtime by user modelling. To facilitate the specification of any learning scenarios it is advisable to use learning design templates (Leshin *et al.*, 1992). In turn, to consider the adaptive functionalities that could come out of the interaction data (i.e., user modelling) in an adaptive LMS, the LD has to be extended with new adaptive features. In particular, we are covering two pedagogical scenarios that cannot be predicted when they arise at design-time: lack of knowledge and high interest level. To help the learner in both settings a Recommender Subsystem launches a recommendation based on user’s interactions.

An adaptive scenario in aLFanet covers the so called “adaptive full life-cycle” of learning. This means to consider the different phases of the learning process (i.e., design, administration, use and auditing) as a whole and, consequently, their mutual dependencies. For instance, providing valuable reports to authors, focused on learners’ performance (usage phase) over pre-defined learning tasks (auditing phase), so that design adjustments can be made (design phase) (Rosmalen *et al.*, 2004):

aLFanet has been evaluated at four different pilot sites: “Spanish course for German Learners” (KLETT), “Environment and Electrical Distribution” (EDP), “How to teach through the Internet” (UNED) and “Communication technology” (OUNL). From this evaluation we have detected some problems in developing standard-based adaptive learning management systems. Some of them were just technical issues. For instance, although adaptive features were highly valued, users suffered performance problems (the system is built up on several independent components, like dotLRN⁶ and Coppercore⁷, which are accessible online). But the real challenge has been constructing adaptive scenarios. The construction process of an adaptive scenario consists of a sequence of steps with increasing levels of details and possibilities for adaptation. Using design templates (Leshin *et al.*, 1992) facilitates the development of the skeleton of the IMS-LD template (e.g., a design template for concept learning) but authors have experienced difficulties in managing the variety of adaptive features available in a system like aLFanet.

Having all that into account we can conclude that the increasing use of ICT at HE will improve the interoperability of available services. Nevertheless coping with personalised adaptive scenarios in online courses is still an open issue that requires further research not just on technical issues but also on management problems.

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3. References

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⁵ <http://www.imsproject.org/learningdesign/>

⁶ <http://dotlrn.org/>

⁷ <http://www.coppercore.org/>

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