

An IT Design to Suit our Methodology

Pérez Marrero, Antonio Sergio

Special Didactics Department, University of Las Palmas de Gran Canaria
antoniosergio.perez@ulpgc.es

Abstract. The use of IT for teaching and learning is widely accepted as a means to enhance the learning experience. Hence, education professionals at all levels experience the impulse to introduce some kind of IT design in classrooms of every kind, where the use of IT has, at points, become mandatory. Nevertheless, there are little conclusive data that pinpoints what are the exact benefits that a given IT design, per se, brings to teaching or learning [1,2,3,4]. As any other technology, we contend, IT should be closely associated to the teaching methodology to be implemented, having into account all the factors that are going to influence all the process. In this article, we will analyse parameters that are considered to be critical if we are to predict the possible success of an IT design.

Keywords. ICT, IT, Technology-rich Methodology, Learners' attitudes, Educational contexts, Web 2.0, PLE, CMS

1 Introduction

The use of IT for teaching and learning is widely accepted as a means to enhance the learning experience. Hence, education professionals at all levels experience the impulse to introduce some kind of IT design in classrooms of every kind, where the use of IT has, at points, become mandatory. Nevertheless, there are little conclusive data that pinpoints what are the exact benefits that a given IT design, per se, brings to teaching or learning [1,2,3,4]. As any other technology, we contend, IT should be closely associated to the teaching methodology to be implemented, as well as wisely customised to cater for factors that somehow affect the implementation of ICT in an educational context. For example, Tay *et al* [5] mention context, course content, and pedagogy as factors affecting teaching and learning. Another factor that affects the process is motivation, influenced, in turn, by the “learning and teaching process, competencies of instructors, participants' attention, the online learning environment/technical infrastructure, and the time management” [5]. These are all issues we will have to analyze in the fine-tuning of our design to some extent.

2 Factors Affecting Students' Attitudes towards the Use of ICT in Formal Learning

However, having relatively very little time to foster any learning within formal teaching and learning contexts,¹ the attitude of users towards these innovations becomes critical. From the very beginning, our students should be willing to invest their time and effort doing something they perceive as being worthwhile. It is their own time and effort, and they have already built up expectations about what the learning process should resemble. Karamanos and Gibbs [6] claim that learners need to be persuaded that the new environment offers clear advantages over the traditional method. The implemented system would have to be devised and presented as being easy to use, with the tools used having some level of familiarity for the learner including premises resembling tools they already use and with learners being able to test it out very early in the implementation process [6]. Once initiated, students will also unavoidably affect the system design. Grant [7], in a research project involving the use of wikis, sustains that the subjects' attitudes helped define its implementation since "students appeared to import practices of individualised written assessment that they perceived as important from the broader economy of education and the practices of the school community" [7]. It is suggested that there needs to be a debate to bring about changes in methodology to foster collaboration. Teachers should actively train learners in how to collaborate together, and then find the appropriate tools [7]. Judd, Kennedy and Cropper [8] also claim to have proved that this is so in their own research on the use of wikis for collaborative learning. It is due to the way in which the different learning activities are deployed by the teacher, including the right technological tools and the ways in which learners are expected to engage in the process, that collaboration might happen, and not the technological tools alone, regardless of the potentials they may have [8]. Even so, as we can see in their conclusions [8], the learners were not sufficiently trained for collaboration, and consequently the indicators of cooperation and collaboration among learners were very low. The vital importance of learners' perceptions is also emphasized in Arandia and Fernández [9]. It is the students we have to convince in the first place, so we need to know what perceptions we need to cater for.

Some researchers have provided insights into the importance of the ways in which learners perceive learning innovations. Concepts such as 'Perceived Usefulness,' that is how useful students perceive the tools to be, 'Perceived Ease of Use,' or the level of difficulty the students consider the tools to pose, and 'Perceived Fit,' or how appropriate students think the tool is for the task at hand; all of these are considered to be key factors for technological innovation in learning environments [10,11,12,13,14,15]. Al-Busaidi and Al-Shihi [16] add the concept of 'User Self-Efficacy,' defined as the judgment people make of their capabilities to succeed in certain performances. They claim that it is a major drive for the success of IT implementation [16]. There seems to be a close connection between 'User Self-Efficacy'

¹ There is strong evidence that time is a crucial factor in the production of learning with new methodologies [17].

and 'Perceived Usefulness,' which are factors, together with 'Perceived Ease of Use,' that would help predict attitude, intention and actual use of IT [16].

Attitude is further influenced by learners' 'Experience with the Use of Technology' to be implemented [16] [18]; that is the previous experience the user has of using IT and the skills obtained from it. A technology-rich scenario with learners of a low technological profile would inhibit learning. Almost twenty years ago, Hillman, Willis and Gunawardena [19] claimed that "technologically-challenged" learners would have to overcome the difficulties with the specific technological interface to be implemented as well if involvement in the learning process is to be expected. Facing a new tool, 'Personal Innovativeness,' that is the inclination to experiment with and use new technology regardless of the experience of others, is yet another trait we need to take into consideration [16] which may also have an influence on 'Perceived Usefulness' and 'Perceived Ease of Use.'

We can see empirical confirmation of the importance of these factors in Judd, Kennedy and Cropper [8] who consider that if they had made more emphasis on providing "support and familiarization" for learners to feel at ease using wikis, more collaboration could have arisen. This, we believe, would have changed students' 'Perceived Usefulness,' 'Perceived Ease of Use,' and 'User Self Efficacy' of the tools and the methodology at least, as well as enhancing students' 'Experience with the Use of Technology.' Another example can be seen in Yuen and Yang [12]. 'Perceived Usefulness,' substantiated in the form of students' perceived learning, is also referred to as a major drive [12] in the context of an empirical study on the effectiveness of blogfolios (blogs used as portfolios) for university students. They conclude that students' level of comfort and self-regulation have a major influence on raising the level of overall interaction [12], and interaction, in turn, raises learners' satisfaction with instruction and, thus, perceived learning [12].

We need to avoid being misled by the expectations raised by the 'digital native' construct. Selwyn [20] claims that the digital native is often portrayed as an "empowered" individual who can not only use different tools at the same time, deploying a number of multi-tasking capabilities, but who is also an active agent of their own learning processes, ready to collaborate with others on common interests and tasks, and an autonomous, yet cooperative, individual. This seems to be, they claim, more social wishful thinking than reality. The definition of the digital native seems to be a description of what kind of future we want to have rather than the society the young are taking us into [20]. Making reference to research, the author claims that the reality of the digital native is, in most cases completely the opposite: a passive, individual user of media provided online [20]. There is evidence that young learners would not even expect or want to use IT inside the formal institutions of learning as they do at home [20]. Tay et al [5] claim that students' inclination to adopt a passive, viewing role more than an active, participating role was confirmed in their research. The mere introduction of technology will not change this reality overnight.

Furthermore, Zhang [21] admits that adult learners differ from other learners in how they commit themselves to something they know the goals of, especially if these are "realistic and important for them." He suggests that their positive results could have been different if the learners had not been committed adult learners [21]. This

would, de facto, support the idea that if his learners had been adolescents, the results might have been different.

3 The Influence of the Educational Context

Area [22], in an analysis of the role of ICT in state schools in the Canary Islands through direct observation of schools concludes that the introduction of ICT in both primary and secondary schools has not meant any significant pedagogical change on the part of teachers. Changing the culture of a academic institutions is not easy, even though implementing ICT has come to be the leitmotif in most of the current debates happening among professionals. Authors like Paredes [23] believe that the implementation of any ICT innovation could bring uneasiness; it might break the harmony that may exist at the institution, it generates ambiguity, and it adds problems to the existing ones. The impulse to implement ICT led methodology should be preceded by the will to change the culture within the educational institution first [23], and, consequently, it is only when ICT designs are fully integrated into the institution that quality implementations will arise. However, we have to bear in mind that innovation is not easily adopted. For Rogers [as cited in 17], only 15% of the population within an institution would easily adopt a technical innovation. The state ICT network has made access to technology easier, but it has so far been received as a new way of doing the same as before since teachers have, generally speaking, adapted available resources to traditional ways of teaching [22]. Important evidence of this reality is that the curriculum planning process that academic institutions have to undertake every year (subject syllabuses, and other school documents) has not significantly changed with the widespread introduction of technology [22]. It is only in small ad hoc innovations that we can see some changes in the teaching-learning process, but always in line with the methodology currently used by the teacher [22]. That is to say, the teacher who innovates will do so regardless of the technology used [24].

As instances of the importance of the teaching environment at a school when designing an ICT facility we can refer to work by Grant [7] on the use of wikis to foster collaboration among secondary school students and Wolpers et al [18]. Grant [7] claims that “while popular and academic writing valorises the potential of social software and wikis to usher in new forms of learning, there is a need to understand the realities of such software use in a real educational context.” In fact, although Grant’s research was based on an open Web 2.0 facility, she was asked to customize the wiki in such a way that students’ production was completely hidden and accessible only for authorized members of the educational institution for fear of “abusive or offensive posts” and/or authorship issues [7], thus leading to the platform becoming devoid, according to Grant [7], of “authentic, relevant and worthwhile practice.” Therefore, a potentially open tool was customized to turn it into a controlled, closed environment that would match a more traditional methodology. Wolpers et al [18], within their

research on the use of Responsive Open Learning Environments in China,² concluded that implementing an Open Learning Environment to become a Personal Learning Environment (PLE) is inevitably constrained by the "Confucian culture of China" [18], where the teacher is traditionally the centre of the teaching process without much learner involvement, not even within the context of the traditional classroom.

Along the same lines, Karamanos and Gibbs [6] claim that although e-learning technology innovations have advanced well into academic institutions, the same cannot be said about e-learning pedagogy³ which "still remains at innovator stage" since it has not reached the status of widespread usage by students nor teachers [6]; the same idea is also present in Paredes, [24]. When describing a theory and methodology for implementing change in education called the 'Concerns Based Adoption Model' [6], they claim that users undergo a series of stages of concern in the process of implementation of an innovation. The first stage would be concerns unrelated to the innovation which would turn into self concerns (what the experience would be like for 'me,' whether I can succeed), then into task concern (on the actual use of the innovation) and finally to impact concerns (e.g. is the innovation really going to bring improvements?). Thus, they ascertain the importance of a change facilitator, an agent that would actively promote the innovation through interventions, that is actions to influence the individuals involved in the innovation. They claim that the Concerns Based Adoption Model includes five functions in the possible interventions: "developing and communicating a shared vision of change, planning and providing resources, investing in professional learning, checking on progress and providing continuous assistance" [6].

The role played by educational institutions is also analyzed in Al-Busaidi and Al-Shihi [16]. They have identified some organizational factors that would affect 'Perceived Usefulness' and 'Perceived Ease of Use.' They mention several issues that are

² They describe ROLES as "characterized through their openness for new configurations, contents and users and through their responsiveness to learners' activities in respect to learning goals" [18]. They designed an interconnected set of widget to be further on selected by the user depending on need on a host platform that would perform language learning tasks (displaying multimedia texts on a widget, and a dictionary on another, with a vocabulary training widget), all selected by the user [18].

³ Karamanos and Gibbs [6] make reference to the difference between e-learning technology and e-learning pedagogy, whereby the first would embody the technology used to deploy an e-learning instance; and the latter would cover the learning and teaching principles behind the e-learning instance. Gutiérrez-Colon Plana and Pladevall [25] also established a direct relationship between the methodology used by the teacher and the success of the technology used. For them, "the more the teacher knows how to use the virtual environment from a methodological point of view, the better the students feel in the classroom and therefore the better the teacher facilitates their learning process" [25]. Lorente-Guzman *et al* [26] also distinguish between technology and methodology when describing collaborative ways of working with students and the different technological stances used to substantiate them.

instructor-specific: ‘motivators,’ described as the capacity that an organization has to incentivize their members in terms of teaching awards, promotions or tenures, or organization support, in terms of senior managers supporting the instructors. But there are others that may be more universal, like technology alignment, or the seamless adaptation of technology to the curricula, that would obviously affect the instructors’ Perceived Usefulness and Perceived Ease of Use, but would also have an obvious influence on the learners themselves. For Keengwe and Georgina (2011:367), faculty members may be reticent to learn the skills required to manage learning in an online context. So they suggest gradual integration, going from using technology in their classrooms before going into online instruction (*ibid*). In their article, they describe a course they implement at the Midwestern University called the Digital Course Training Workshop, aimed at assisting the faculty in the process of integrating online instruction into their teaching. They conclude that the teachers involved in the program improve their perceptions of their IT skills and, consequently, e-learning instances grew in numbers (*ibid*:377).

4 Reservations about How Effective Web 2.0 is in Formal Learning

Regarding the use of Web 2.0 as a learning tool to build PLEs, there is no clear, univocal opinion regarding its benefits in formal learning. Wang and Vásquez (2012:423) claim that there are some disadvantages to using Web 2.0 for learning, coming mainly from the lack of training on the part of the learner. For instance, in the case of blogs, learners may not use the right register or take the reader into account when they are writing. Regarding the issue of collaboration, it is claimed that learners need to be trained to be able to give “appropriate comments to their peers” (*ibid*:423), as we have also seen above. In fact, as shown in Fu, Yang and Huang (2012:8), there are a number of research publications that offer contradictory results regarding how effective blogs are as a means to foster learners’ participation. Panagiotidis (2012:435), in an article analyzing the advantages and disadvantages of PLEs, acknowledges the difficulties involved in their implementation. He mentions class management, authentication, and assessment tools as services which are very difficult to provide if you have decided to use a PLE. Another difficulty in such an open design is the existence of potential distractions for the learner that could hinder the process of learning. As a way to balance the strengths of both systems, Panagiotidis suggests (*ibid*) that both systems, LMS (Learning Management System) and PLEs, could be combined to give a better answer to formal contexts and informal learning.

There is also a high percentage of teachers and learners who have a negative perception of Web 2.0 as learning tool. Tu *et al* (2012) state that this negative perception comes from a lack of knowledge about the tools themselves, the consequent difficulty of learning to use different tools, having to visit different sites, and the authentication hassle. However, they consider this to be more a symptom of not understanding the actual networked learning paradigm, and the inappropriate integration of the different tools implemented (*ibid*:13), which is, precisely, one of the key issues for ICT im-

plementation in general at schools as we have mentioned above. They consider that the use of Web 2.0 in a formal learning context requires a shift into a more decentralized learning mentality, both for teachers and students, where emphasis is put on the personal effort of learners and collaboration (*ibid*:18).⁴ In fact, evidence shows that, although technology provides a wide range of possibilities for learning, they will only materialize if the factors affecting the implementation are catered for.

There is also a shortness of empirical studies as yet that could substantiate the potential benefits of Web 2.0 for foreign or second language learning (Malhiwsky, 2010:75). Regarding the scientific consistency of research related to Web 2.0, Wang and Vásquez (2012:419) stated that in the majority of studies accessed in their research on the effectiveness of the use of Web 2.0 in second language learning, there was no theoretical framework taken into consideration: researchers either do not mention it or “did not appear to have an obvious theoretical foundation.” This would account for a lack of well justified research on Web 2.0 (*ibid*:424). Only around nine percent would be related in some way to social constructivism, and none of them to connectivism. Most of the studies deal with higher education learners. Other weaknesses mentioned are the lack of in-depth insight on the issues explored, “technocentrism,” that is not regarding the pedagogical approach properly, and the absence of contextual variables in the parameters affecting the results (*ibid*:419-420).

5 Current Considerations of Learning Management Systems

LMS are still an innovation in secondary education as most students have never had an experience with e-learning, and this has a direct influence on the decisions taken at university level. Lorente-Guzman et al [26]⁵ claim that in Valencia only 32% of the secondary schools use some kind of learning platform, including Content Management Systems. This is perceived as positive [26], but it is still far from becoming a mainstream concept. However, there is a drive that is already promoting their use, an example of which is the above mentioned study by Area [22]. Another instance is the project called EVAGD⁶ in the Canary Islands, which is an initiative with local government support to provide a slot in a common platform for any teacher in the Canary Islands who might need it. Another important factor is the widespread use of the LMS at university level all around the world [27], and, more specifically, at both universities in the Canary Islands. In Horizon Report [28], it is stated that learning analysis

⁴ As was also exemplified in Grant [7] above where we described the characteristics of learners.

⁵ We have not found any similar study about the situation in the Canary Islands, the context for our own research project, but since the case in Valencia is in the same country and the schools included also belong to the state system, we argue that we could safely assume that the situation here is similar.

⁶ <http://www3.gobiernodecanarias.org/medusa/ecoescuela/proyectoevagd/> Last accessed March19th 2014.

needs to include more data than those provided by LMS, assuming they are still a central part of instruction at university. For some authors [16] [29], LMS are still a means to enhance the learning process inside the classroom.

What is more, although there are calls from both teachers and researchers to move forward from the LMS into more open technological designs [30,31], there are also many authors that still consider the LMS as a central ingredient of current and future relevant e-learning facilities [32,33]. Those authors that consider LMS to be outdated also suggest that they still have a role to play [30,31] [34,35]. There have also been efforts to integrate LMS into the more learner-centered concept of PLEs [31] [34]. We can see an instance of this in the use of *Mahara*, a learning portfolio facility that can be integrated in *Moodle*, or the conditional modules developed by the CICEI in the University of Las Palmas de Gran Canaria.

6 Conclusions

The learners we are aiming our teaching endeavors to are, therefore, a critical parameter in the design of the IT model we intend to implement in our teaching context, if we expect to be able to predict if our model is capable of fostering learning. We need to move away from the popular digital native construct, and inquire into what the real profile of learners is. Notwithstanding the crucial importance of the actual learner we will cater for, we should not trivialise the underpinnings of the educational context we are to implement our model in, and, of course the assets and hazards of using the different IT formulations. Finally, and as the keystone to our model, we should place the methodology we consider to accommodate our learners needs and the peculiarities of our context best, and the IT model should follow suit, not underestimating any given formulation: from the most unconventional web 2.0 facility that explores the untread paths of active involvement, to the more mainstream, constrained LMS. Our model as teachers should parallel our design, scouting the desired frontiers having the above mentioned parameters in mind.

References

1. Cuban, L.: *Teachers and Machines: The Classroom Use of Technology since 1920*. New York: Teachers College Press (1986)
2. Tyack, D. and Cuban, L. *Tinkering toward Utopia: A Century of School Reform*. USA: President and Fellows of Harvard College (1995)
3. Cuban, L.: *Oversold and Underused: Reforming Schools Through Technology, 1980-2000*. Cambridge MA: Harvard University Press (2001)
4. Macaro, E., Handley, Z., and Walter, C.: A Systematic Review of CALL in English as a Second Language: Focus on Primary and Secondary Education. *Language Teaching*, 45.01, 1–43 (2012)
5. Tay, L.Y., Lim, Ch. P., Lye, S.Y., Ng, K.J., and Lim S.K.: Open- source Learning Management System and Web 2.0 Online Social Software Applications as Learning Platforms for an Elementary School in Singapore. *Learning, Media and Technology*. 36.4, 349–365 (2011)

6. Karamanos, N., and Gibbs, P.: A Model for Student Adoption of Online Interactivity. *Research in Post-Compulsory Education*. 17.3, 321–334 (2012)
7. Grant, L.: 'I DON'T CARE DO UR OWN PAGE!' A Case Study of Using Wikis for Collaborative Work in a UK Secondary School. *Learning, Media and Technology* 34.2, 105–117 (2009)
8. Judd, T., Kennedy, G., and Cropper, S.: Using Wikis for Collaborative Learning: Assessing Collaboration through Contribution. *Australasian Journal of Educational Technology* 26.3, 341–354 (2010)
9. Arandia Loroño, M., and Fernandez Fernandez, I.: ¿Es Posible un Curriculum Más Allá de las Asignaturas? Diseño y Práctica del Grado de Educación Social en la Universidad del País Vasco. *REDU. Revista de Docencia Universitaria*. 10.3, 99-123 (2012)
10. Abrami, P.C.: On the Nature of Support in Computer-Supported Collaborative Learning Using gStudy. *Computers in Human Behavior* 26.5, 835–839 (2009)
11. Mlitwa, N., and Van Belle, J.: A Proposed Interpretivist Framework to Research the Adoption of Learning Management Systems in Universities. *Communications of the IBIMA*. 2010, 1–11 (2010)
12. Yuen, S.Ch., and Yang, H. H.: Using Blogfolios to Enhance Interaction in E- Learning Courses. In: Hao Yang, Harrison, and Steve Chi-Yin Yuen (eds.) *Handbook of Research on Practices and Outcomes in E-learning: Issues and Trends*, pp. 455-470.: Information Science Reference, Hershey (2010)
13. Pynoo, B., Pieter Devolder, Tondeur, J., Van Braak, J., Duyck, W., and Duyck, P.: Predicting Secondary School Teachers' Acceptance and Use of a Digital Learning Environment: A Cross-Sectional Study. *Computers in Human Behavior*. 27.1, 568-575 (2011)
14. Lin, W.: Perceived Fit and Satisfaction on Web Learning Performance: IS Continuance Intention and Task-Technology Fit Perspectives. *International Journal of Human-Computer Studies*. 70.7, 498–507 (2012)
15. De Smet, C., Bourgonjon, J., De Wever, B., Schellens, T., Valcke, M.: Researching Instructional Use and the Technology Acceptation of Learning Management Systems by Secondary School Teachers. *Computers & Education*. 58.2, 688–696 (2012)
16. Al-Busaidi, K.A., and Al-Shihi, H.: Instructors' Acceptance of Learning Management Systems: A Theoretical Framework. *Communications of the IBIMA*. 1-9 (2010)
17. Blau, I., and Hameiri, M.: Implementing Technological Change at Schools: The Impact of Online Communication with Families on Teacher Interactions through Learning Management System. *Interdisciplinary Journal of E-Learning & Learning Objects*. 6, 245-257 (2010)
18. Wolpers, M., Friedrich, M., Shen, R., Ullrich, C., Klamma, R., and Renzel, D.: Early Experiences with Responsive Open Learning Environments. In: I-KNOW 2010, pp. 391-402. Eds. Tochtermann, Klaus, and Kiel Hermann Maurer *Journal of Universal Computer Science*, Graz (2010)
19. Hillman, D. CA., Willis, D.J., and Gunawardena, Ch.N.: Learner-Interface Interaction in Distance Education: an Extension of Contemporary Models and Strategies for Practitioners. *American Journal of Distance Education*. 8.2, 30-42 (1994)
20. Selwyn, N.: The Digital Native – Myth and Reality. *Aslib Proceedings*. 61.4, 364– 379 (2009)
21. Zhang, D. "Interactive Multimedia-Based E-Learning: A Study of Effectiveness." *American Journal of Distance Education*. 19.3, 149–162 (2005)
22. Area Moreira, M.: El Proceso de Integración y Uso Pedagógico de las TIC en los Centros Educativos. Un Estudio de Casos. The Process of Integration and the Pedagogical Use of ICT in Schools. *Case Studies. Revista de Educación*. 352, 77-97 (2010)

23. Paredes, J.: Innovadores en Espacios Reinstrumentalizados. Aproximaciones Etnográficas y Narrativas a Los Centros Innovadores con TIC en Educación Primaria y Secundaria. REICE: Revista Electrónica Iberoamericana sobre Calidad, Eficacia y Cambio en Educación. 8.1, 45–62 (2010)
24. Paredes, J.: Perfiles de Docentes en los Modelos de Enseñanza que Emergen de los Usos de Plataformas E-Learning en España. Revista Latinoamericana de Tecnología Educativa-RELATEC. 8.1, 53-63 (2009)
25. Gutierrez-Colon, M., and Pladevall, E.: Beyond the Technology in Computer Assisted Language Learning: Learners' Experiences. English Language Teaching. 2.4, 3-12 (2009)
26. Lorente-Guzmán, D., Cutanda García, E.M., Fernández Diego, M., and González Ladrón de Guevara, F.: Utilización de Herramientas Tecnológicas Colaborativas en el Sector de la Formación. El Caso de los Centros Públicos de Enseñanza Secundaria. Economía Industrial. 374, 139-147 (2009)
27. Ramakrisnan, P., Jaafar, A., Abdul Razak, F.H., and Anak Ramba, D.: Evaluation of User Interface Design for Learning Management System (LMS): Investigating Student's Eye Tracking Pattern and Experiences. Procedia - Social and Behavioral Sciences. 67, 527–537 (2012)
28. Johnson, L., Levine, A., Smith, R., and Stone, S.: Horizon Report 2010: K-12 Edition. New Media Consortium, Austin (2010)
29. Aydin, C.C., and Tirkes, G.: Open Source Learning Management Systems in E- Learning and Moodle. Education Engineering (EDUCON). 593-600 (2010)
30. Siemens, G.: Connectivism. A Learning Theory for the Digital Age. 12 December 2004. <http://www.elearnspace.org/Articles/connectivism.htm> Accessed 25/08/2013
31. Sclater, N.: Web 2.0, Personal Learning Environments, and the Future of Learning Management Systems. Research Bulletin. 13, 1-13 (2008)
32. Brown, S. From VLEs to Learning Webs: the Implications of Web 2.0 for Learning and Teaching. Interactive Learning Environments. 18.1, 1-10 (2010)
33. Zaharias, P., and Mehlenbacher, B. Exploring User Experience (UX) in Virtual Learning Environments. International Journal of Human-Computer Studies. 70.7, 475– 477 (2012)
34. Sclater, N. Reports of the Demise of the VLE/LMS Are Greatly Exaggerated. Learning Innovations. 09 September 2009b. n.pag. <http://sclater.com/blog/reports-of-the-demise-of-the-vlelms-are-greatly-exaggerated/> Accessed 25/03/2013
35. Sclater, N.: Reports of the Demise of the VLE/LMS Are Greatly Exaggerated, Learning Innovations. 09 September 2009b. n.pag. <http://sclater.com/blog/reports-of-the-demise-of-the-vlelms-are-greatly-exaggerated/> Accessed 25/03/2013