Building a Successful e-Learning Project in Higher Education

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***Abstract*— Internet has made our world, the way we live and educate, more dynamic and virtual than ever, creating greater challenges and new possibilities. In this way, it is important that higher education institutions have, as a priority, the goal of finding effective ways of providing new learning opportunities according to their environment: student characteristics; teacher training; economic crisis and advancing technology in an effort to make learning more efficient, equitable and innovative. At Guarda Polytechnic Institute, Portugal (IPG), we recognize the needs and the opportunities to create and develop new e-education courses in order to engage and motivate students and teachers according to their needs. Thus, we have, in this last decade, developed and implemented a set of institutional objectives with regard to teaching electronic courses which aim to provide intuitive content online courses, easy to access anywhere, any time. The main purpose of this paper is to present our strategies as an institution, vision and goals when we talk about electronic learning. We bring forward what we believe to be extremely important and that must be considered when an organization wants to implement and develop e-Learning. The paper also presents the outcomes and synthesizes the insights collected since when we implemented a mobile learning solution. Findings indicate that building a successful e-learning project depends basically on two components, teachers' training and students' characteristics. The focus attention on these two components can create new, successful and powerful opportunities of e-learning.**

***Index Terms*—education; e-learning project; higher education, learning 2.0**

I. Introduction

As daily consumers, as teachers, and as students we all recognize that technologies are increasingly being more and more used in society and in the economy, and this is transforming the ways of working, studying (lifelong learning), communicating, accessing information and spending leisure time, among others. Several studies, conducted in this last decade, have shown that the evolution of the World Wide Web and ICT could enable creative and innovative practices in schools. The value of information, offered at Web sites, can enhance students' research, developing new skills and new methodologies to become critical users of the Web and the Internet, thus playing an important role in education. Learning should be reflective of underlying social environments [1], [22].

The evolution of the World Wide Web, driven by user-generated content, represents a new form of collaboration and communication creating new tools such as platforms, blogs, podcasts and wikis. Web 2.0 means a qualitative leap in Web technologies that has made internet more creative, participative and social [12].

Web 2.0 has changed, particularly in these last five years, in the way we produce, distribute, and evaluate the use of knowledge and information in the field of education. In this way, ubiquitous technology and Web 2.0 tools play today a fundamental key role in promoting technology-enhanced learning and creating new learning concepts and new opportunities in the field of learning. Social computing or web 2.0 applications have been developed all over the world by key research centres in a number of projects that aim to assess the impact of web 2.0 trends on the field of learning and education.

Research evidence suggests that these online tools, web technologies, have not only affected people's private and professional lives, but are also starting to transform learning patterns and pathways [20], [1] and also demonstrated the benefits of applying these technologies to learning [17].

It is clear that the concept of learning has penetrated schools' walls, generating a number of concepts as e-learning, blended learning and mobile learning. Teachers and students are no longer located physically on a school campus, but living and studying in a virtual world, more real than ever. This new world allows for creative and collaborative participation in the process of learning. In this context, several authors have defined and introduced new terms such as Learning 2.0 , Web-based learning or Internet-based instruction to relate to a learning-teaching process that takes places with the use of ICT and Web 2.0 tools [14], [11].

The rapid growth of online education has promoted the need to rethink delivery structures and pedagogical practices that were once appropriate [4]. These technologies allow educators to collaborate and interact with students in a new

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learning environment. In Portugal, almost all higher education institutions have implemented an e-learning system.

Some of the changes with the most impact on a successful electronic educational process are, in our opinion, teacher's adaptability and student's characteristics. Accordingly, in this last decade IPG has intended to build an e-learning project according to these two perspectives and according to the Bologna process and its effects on higher education, which reflects a shift from a teacher's perspective into a student's perspective who are no longer passive recipients of information. The use of e-Learning technology in IPG is no longer an option but has become a necessity. It is of major interest for us, as institutions, from an evolutionary perspective, to understand the role of teacher and student demand, to incorporate new e-Learning strategies and perceive the effectiveness of the use of Web 2.0 tools in class.
E-Learning technology that is used optimally and effectively can position institutions at a more competitive level. In order to respond to new student markets and changing needs and expectations, higher education has to define clear and comprehensive strategies for the integration of e-Learning and all those involved in the process (leaders, administrators, teachers and students) must be drawn in and taken into account throughout the process [7].

A. Teaching and learning.

The increased need for teacher adaptability, according to student characteristics and web 2.0 tools, has important implications for the future of education, training and competitiveness of schools. It is therefore crucial that institutions promote discussion and define strategies about new pedagogical activities so as to trigger creativity in their methods. Free mobility in the learning process, offered by Web 2.0 tools, allows for the development of new creative learning approaches where teaching is now a process that can occur anywhere and at any time. This technology allows educators to collaborate and interact with students, who are no longer passive recipients of information in new learning environments [2].

If it is evident that though teachers are major stakeholders in the field of education and training, it seems that they are rarely consulted about their training needs or when the future of learning is at stake. In order to develop creative learning approaches, it is important that institutions should establish a clear strategy to define and implement solutions for teacher training in accordance with the new capabilities of "learning 2.0". Offering training that prepares teachers to become reflective practitioners, making them able to determine how a teaching method or activity can stifle or trigger creativity in their students with the use of different e-Learning components. Nonetheless, it is important to define just how teacher training can effectively be implemented for the use of technologies and Web 2.0 services.

It is clear that further education in this area remains a major challenge because the list of digital skills expected of a teacher is growing every day and new pedagogical methods and strategies must be continually offered to their students according to their needs and characteristics.

In IPG, the major challenges for a teacher are to acquire new skills and new pedagogical methods and strategies while faced with the numerous daily tasks such as: publishing papers, making a PhD and participating in the educational activities of the institution.

B. Students and Learning

Another important point is related to the fact that today's students have always been surrounded by, and interacted with, new technologies. Marc Prensky states that students have changed radically and are no longer the people our educational system was designed to teach, calling them Digital Natives [18]. But other authors with this perspective have also defined nowadays' students as Net Generation learners [15] or New Millennium Learners [16]. In a general perspective, all these authors defend that students are highly dependent on technology and use technology extensively for networking and socializing.

At present, relationships are defined by convenience and interest; students can now work wherever and whenever. Students born in the three last decades, according to our bibliographic references, are able to connect, share, and create new information, using an intuitively different variety of ITC devices simultaneously. Individuals have more control and ability to create and to connect to each other [18]. Some authors describe the characteristics of these new students as: Digitally Literate; Connected; Immediate; Experiential, Social; Teams, Structure; Engagement and Experience; Visual and Kinesthetic, and Things that Matter [9]. The generation of the 'New Millennium Learners' could be also characterized as multitasking, having short attention spans, and gaining information in non-linear ways [12]. This new generation of students, while being extremely social, also needs a sense of security and as a consequence of their social nature, they often prefer to learn and work in teams [15].

These characteristics have an effect on the way students build their identities, communicate socially, and manage information and knowledge. All this new technology has strong implications for the teaching-learning process by changing the ways in which knowledge is transmitted, acquired and handled. Recent investigations have shown clear evidence about the changes occurring in the last decade with respect to changing the paradigms of learning, attitudes, learning styles and patterns [19].
Learning in the digital era is fundamentally collaborative and aims to facilitate the learning process by providing social and cognitive guidance and support. Today the learner plays a central role in the learning process as an active author, co-creator, evaluator and critical commentator [18]. In this context researchers have proposed various approaches to develop adaptive learning systems based on the personal features, characteristics, or learning behaviors of students to improve learning efficiency [8].

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II. Background

The case study in the e-educational world was conducted at IPG in the context of Portuguese higher education, oriented toward student education, research projects, and community services as well as cultural exchange with other national and foreign institutions. Its mission is to improve knowledge and educate students in science, technology, education and other areas of knowledge that will best serve the country and the needs of the European market. The Institute is committed to generating, disseminating, and preserving knowledge. In Portugal, higher education is divided into two main subsystems: university and polytechnic education and currently there are nearly 400,000 students spread over 35 public higher education institutions and 94 private higher education institutions.

The Decree 303/80, of 16th August, founded it in 1980, but its statutes were recognized only in 1985. In 1986, the School of Education (ESECD) began its activities. One year later, the School of Technology and Management (ESTG) also opened its doors to the Higher Education System. In 1999, the School of Tourism and Telecommunications in Seia (ESTH) was founded followed, in 2001, by the integration of the Health School (ESS) in this Polytechnic Institute. At the moment, the student community of this Polytechnic Institute exceeds 3 000 elements, with an educational board of 350 professors.

Its four schools encompass numerous academic departments, divisions, and degree-granting programs, as well as interdisciplinary centers, laboratories, and programs whose work cuts across traditional departmental boundaries. The unit responsible for the entire e-Learning project is the Center of Information Technology (CI).

CI is a unit of services to support teaching, research and service. It is responsible for ensuring the proper functioning of existing information technologies and to support students, faculty and staff in this area. Integrated in the CI, there is a technology-enhanced learning group, as we call it, that provides vital resources to integrate educational and information technologies into the academic environment. CI staff is composed by 5 computer engineers specialized in different areas (network and communications, e-learning platforms, design and multimedia). CI has, as its main goal, to help all IPG community, explore and implement new technologies that can promote and enhance learner-driven education on campus and on online learning. The areas of CI are:

- Distance Learning: Help to coordinate and support IPG curricular units in launching new distance-learning courses.
- Emerging Technologies - Identify and drive new and emerging technologies that enhance teaching, learning, and research.
- Blackboard-Learning Management Upgrade: Improve IPG's Blackboard platform to meet the needs according to new learning students' and learning 2.0 characteristics.
- IPG's Web site: Upgrade and reestructure IPG's website, according to the new features and the need to implement mobile learning and support the e-learning project.
- IPG's support: Developing strategies for the development of teacher training in accordance with the new teaching possibilities offered by LMS learning platforms, mobility, connectivity, web 2.0 tools and Learning 2.0.

All the community has access to the IPG platform, essentially to understand and use all the e-learning process. The e-learning platform used at IPG, Fig. 1, is Blackboard Academic Suite, a global leader in use by higher education institutions. This platform allows access to an online virtual learning environment by the student, where, in addition to accessing content uploaded by teachers, one can use tools of communication with peers and teachers, access classes, abstracts, submit work, among many other features.

Furthermore, IPG provides its students with a vast range of infrastructures, support mechanisms and services which aim to ensure full integration and effective and rewarding learning.

Fig. 1. IPG Homepage

A. Learning at IPG and the Bologna process

The implementation of the Bologna Process in Portugal led to the adoption of key measures to promote equal opportunities in accessing higher education, by improving student support systems, and levels of participation and completion in higher education programs, as well as attracting new audiences in the context of lifelong learning and ensuring the qualifications of Portuguese citizens in Europe [10]. Bologna refers to the New European Higher Education System. On June 19, 1999, 30 European states signed the Bologna Declaration, promoting the creation of a European Higher Education Area, the formal name for a university system to which all officially accredited European universities belong. The main objective of this process was to encourage convergence in education, employability and mobility within Europe and attract students, professors and researchers from around the world. The Bologna goals are [13]:

- Mutual recognition of qualifications;
- Common degree structures;
- Transferable credit system;
- Mobility programs;
- Quality Assurance;

- Continuous professional development and lifelong learning.

IPG is closely following developments in the implementation of the Bologna Process across Europe and the country. The range of training at the IPG intends to meet the growing and diversified needs of students and society. With respect to IPG, it has been monitoring the developing process. The institution has been active in developing its educational programmes according to the Bologna reforms through changing the degree structure, which was finalized at the end of 2008. IPG assures the quality of the programmes offered under the three cycles of the Bologna Process, as expressed in the Standards and Guidelines for Quality Assurance in the European Higher Education Area.

III. E-LEARNING AT IPG: PHASES AND STRATEGIES

In the year 2002, IPG decided to implement an e-learning system education. This implementation was according to the European Commission's statement based on the initiative "E-learning: designing tomorrow's education" adopted on 24 May 2000 by the European Union. This initiative presented the principles, objectives and prospective actions related to e-learning for Europe and defined the importance of the use of new multimedia technologies and Internet to improve the quality of learning, facilitate access to resources and services, such as exchanges and at-a-distance collaboration. The initiative "E-learning: designing tomorrow's education" was following the conclusions of the European Council in Lisbon [9].

A. IPG e-Learning implementation phases

1) Phase 1 (academic year 2002/3):

E-Learning was implemented at IPG through the integration of IBM Lotus LearningSpace platform. "The fundamental objectives of it was to improve the quality of education, tackling underachievement, and increasing the access to education, implementing a new mechanism of cooperation and interaction between users," commented Constantino Rei, President of the IPG. "E-Learning is an element that decisively contributes to this objective, guaranteeing interaction between students and professors, independent of the premises and time, and guaranteeing the process of ongoing teaching-learning". IBM Lotus LearningSpace platform was being used only by the ESTG School.

Developed strategies and activities (phase 1):

- Developed manual instructions for training teachers in the use of IBM Lotus LearningSpace platform.
- Offered technological training initiatives to the first interested teacher group on subjects like what and how to use e-learning via a platform, using multimedia contents and offering training in the field of new educational collaborative learning processes.
- Some of the first teachers on the first group were the next ones who trained the following groups.
- During this time, some indicators as numbers of available courses and total numbers of teacher access were collected. In this first phase, we realized that a small number of teachers used the platform. And the use made was exclusively to upload contents to students.

All these activities were extremely necessary and required for the consistent understanding and evolution of the implemented solution.

2) Phase 2 (academic year 2004/5):

With the aim of improving the implementation of the e-Learning project and, due to the need in the winter of 2004, it was decided to change the LearningSpace platform to the Blackboard Academic Suite. The use of Learning Management System (LMS) was integrated into the four schools. According to [1] Blackboard Academic Suite promotes and helps institutions across the globe to break down barriers and multiply learning opportunities.

For Constantino Rei, the implementation of the Blackboard' suite was based on its rich suite of applications, designed to deliver a flexible, customizable, and seamlessly integrated operating environment for e-Education.

Developed strategies and activities (phase 2):

- Developed and implemented a set of policies and initiatives regarding technology enhanced learning that provided support to the entire IPG campus. This initiative was put into practice through the CI of the IPG.
- Created new guides and provided extensive education training programs to teachers, according to the new facilities of the Blackboard suite.
- Several studies were produced internally that brought together a rich number of insights:

(2004) to inquire into student class attendance. Records of student attendance at lessons were informative on average, the attendance rate of students enrolled in classes at IPG did not reach 50%.

(2006) to understand the level of teacher and student Blackboard's suite utilization. In the whole, 535 students have participated in this case study, in a total of 1611 students. The students' and teachers' attitude was surveyed using a questionnaire that consists of a group of question items with a five-point Likert scale.

(2008) to present case studies developed by some groups of teachers on the use of forums and collaborative tools present on Blackboard. How and when were the forums used successfully with a group of students?

(2011) to inquire the characteristics and the use of Web 2.0 tools and ICT, by applying a questionnaire to all the community (teachers and students). The questionnaire was available for one month. All the answers were based on a Likert-scale item. The questionnaire included 19 questions. A series of analyses of variance (ANOVAs) was performed to obtain results using SPSS 12.0. All statistical tests were performed with an α value (significance) of 0.05. The results are still being presented in international conferences.

This phase also had a goal which was to integrate the different forms of ICT on campus, implement national ICT educational programs such as eduroam (offering connectivity on all campuses, e-mail and ftp services), VoIP and FCCN

services. We also have created, in this second phase, a multimedia content production department. The aim was to support teachers in the development of multimedia products. Academic staff confidently integrates ICTs into curricula in a manner consistent with the course and its syllabus, according to the Bologna Process.

3) Phase 3 (academic year 2011/12):

In the first semester of 2012, IPG has decided to implement a new mobile learning solution from Blackboard. The establishment of this new solution, Fig. 2, is based on global connectivity to improve efficiency across the IPG campus, thus engaging more students.

Fig. 2. Information develop from CI about mobile learning at IPG

The goal of this new solution is to meet student demand for mobile learning according to students profiles (digital natives) and in accordance to the findings derived from the study conducted in 2011, related to students' and teacher' using web 2.0 tools. According to [6], the objective of this implementation is to reach and engage students through their mobile devices (tablets, smartphones and personal computers), giving students and teachers instant access to courses by being connected and informed anywhere, any time.

Developed strategies and activities (phase 3):

In the third phase, our strategies are still based on offering extensive training to our teachers with the objective of improving quality and of working on the combination of technological applications and collaborative learning methods. We would like to implement some new infrastructures (hardware and software) to support new services of communication between all the participants in this process.

IV. MOBILE LEARNING: ONE YEAR LATER

After almost one year after the implementation of a new mobile learning solution, we present and make a comparison and evaluation of the total number of logins/utilization made by VLE or by mobile. Our purpose, once again according to our strategy and methodology, is to continuously evaluate the implemented solution. The objective, in this case, is to understand if there are some equal patterns of utilization (by hours of the day or days of the week) between the mobile solution and the VLE platform, realize what impact the installation of the mobile learning Blackboard on IPG has caused and derive conclusions about the use made by mobile learning and traditional e-Learning platforms, in order to better understand the use of these two resources.

Consequently, we first show the eleven-month statistical data collected to identify: total logins made by day of the week and total logins by hours of the day in both platforms (VLE and mobile), Fig. 3.

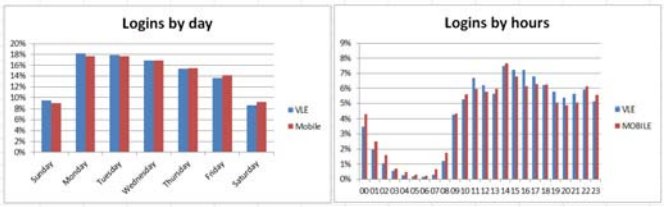

Fig. 1. Logins made by VLE and mobile learning by day and hours of the day

The first objective, as previously referred, was to analyze patterns in terms of students' logins by hours of the day and by day of the week. The results showed some insignificant variation with respect to the login made through VLE or Mobile. So, with regard to daily access, we found that Monday, Tuesday and Wednesday, via Mobile and VLE, are the days that represent greater access. The findings relating to students' logins by hours of the day showed that the afternoon and night are the periods where there are more logins in both systems. Fig. 4 shows the total number of logins made in the platform, by using a mobile device. According to the graphics, we realize that, in these months, Android was the most used mobile phone platform.

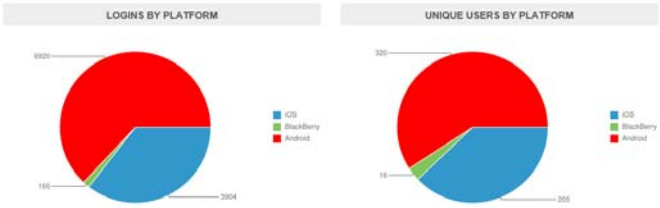

Fig. 2. Overral logins made by mobile learning 15 March 2012 to 06 February 2013 – operating system

V. STRATEGIES AND VISION FOR AN E-LEARNING PROJECT

The overall objective of this paper is to present a review of how, in a Portuguese higher education institution, we have built and managed, in this last decade, an e-learning project step by step. If it is true that we presently have new LMS (e.g., Moodle and/or Blackboard), where all possible features are included, and we also have a diversity of ICT, as mobile devices or PDAs, that makes learning a real possibility available 24 hours a day, 7 days per week, providing new technological solutions and aiming to improve new innovative learning approaches, we believe that the most important feature in an e-learning project doesn't mean having the last LMS or ICT solution. For IPG, it is clear that the most important point in an e-Learning project are human resources (students and teachers). For us, they are the key to improving and creating new innovative learning and developing new teaching and learning skills in order to get maximum benefit in an e-learning project.

As a result, it is our first priority to offer support and pedagogical training to teachers, according to the new potentiality of LMS or ICT and to the new approaches of learning 2.0. With regard to the student, and as it has already

been referred, we constantly analyze our learners' characteristics and analyze student's feedback. We believe that implementing an e-learning project is a continuous cycle, Fig. 5, where we constantly need to evaluate and integrate the most appropriate techniques, methods and implementing innovative ICT solutions to offer support to teachers and students and create new learning concepts.

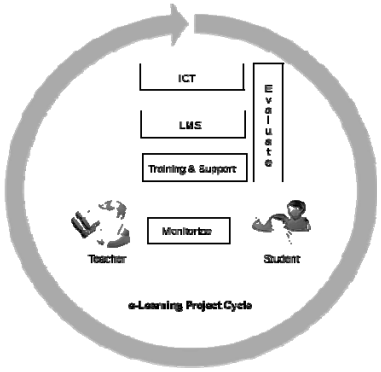

Fig. 5. Life cycle of an e-learning project

Our vision, as a higher education institution, is looking for ways to improve the teachers' and students' learning experience through the use of e-learning and mobile learning tools in complement to blended learning. It is important to promote the development of pedagogical contents within the web 2.0 and develop it, as how we have defined it, as cloud learning, Fig. 6. Cloud learning provides access to learning courses through the use of a large number of tools (e.g. LMS, blogs, Web 2.0) and ICT (e.g. personal computer, PDA) where teachers and students can be located physically at the IPG campus or also dispersed in the virtual world.

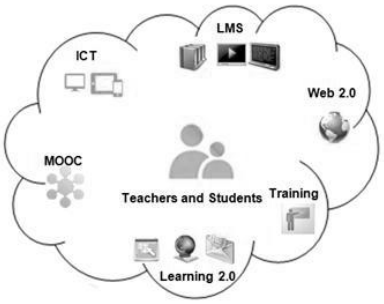

Fig. 6. Vision of TEL-IPG: Cloud learning

VI. Conclusions

E-Learning in Portuguese academies is fully established and consolidated, although there are notable differences in the level of use by teachers and students. Internet, and especially the Web, quickly became a very important strategic tool for education where institutions can find tools and services to provide a high-quality classroom experience. One of the biggest problems faced by some higher education institutions is how to motivate and train their teachers, to offer advanced services so their students can deal with the new concepts of learning. It is clear that further education in this area remains a major challenge because the list of digital skills expected of a teacher is growing every day and new pedagogical methods and strategies must be continually offered to their students, according to their needs and characteristics.

To what concerns the IPG e-learning project, after 10 years and after having implemented the Bologna Process, we believe that our project is just beginning. Teachers are now realizing and recognizing the potentiality of e-Learning.

For other higher education institutions, we suggest that it is important to define a clear strategy. The strategy defined must obligatorily include all human resources, teachers and students, and regularly evaluate the project in all these aspects (ICT, infrastructures, and human resources). Almost one year after the implementation of a mobile learning solution, we realized that the forecasts and expectations made, as an exponential use of mobile learning at IPG, are now not so certain, since the collected data shows us that there is a small increase in the number of accesses by mobile. If, on the one hand, the characteristics of our students portray them as having a high level of: ability with technology; sociability; multitasking and multiple media types, also the current European crisis and in particular the Portuguese crisis is going to affect the purchase of new ITC devices such as PDA and mobiles. If it's true that mobile learning is not primarily about technology, it's clear that without these components mobile learning cannot exist.

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