ELEARNING CURRENT SITUATION AND EMERGING CHALLENGES

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Abstract

This paper aims to present and discuss current, as well as future challenges of eLearning technologies in the higher education institutions and organizations.

eLearning has greatly transformed our way of learning by the use of the newly developed technologies and applications. This paper explores the eLearning current situation. After a brief eLearning history, from the earlier 1960's, with the first generalized computer assisted instruction system PLATO (Programmed Logic for Automatic Teaching Operations) to the 2010's with the development of social media for learning and the MOOC (Massive Open Online Courses). After that, the paper provides a review of the eLearning concept and how it has evolved over the years, followed by a look at the current technologies (from CD-ROMs to Virtual worlds and Game authoring technologies), applications and platforms being used. The emerging challenges are eventually discussed: needs for identifying suitable strategies and understanding the technology and pedagogy integration for effective eLearning implementations referring to pedagogical and

cognitive aspects, level of ICT skills for both all the people involved in teaching, total commitment from management for eLearning system operationalization and sustainability, need for software quality frameworks and standards.

Keywords

eLearning, eLearning history, eLearning technologies, emerging challenges, ICT in education

1. Introduction

One of the broader definitions of eLearning is "*learning that is supported by information and communication technologies (ICT). E-learning is, therefore, not limited to 'digital literacy' (the acquisition of IT competence) but may encompass multiple formats and hybrid methodologies, in particular, the use of software, Internet, CD-ROM, online learning or any other electronic or interactive media.*" (Cedefop Reference series, 2001)

Simply stated, eLearning (or e-Learning, e-learning, online learning, virtual learning, online instruction, educational technology, ...) is electronic learning. This means using an electronic device (computer, smart phone, tablet, ...) to deliver part, or all of a course, whether it is in a classroom or as a full distance course. It is interesting to note the evolution of the field specific keywords used in the literature between 2009 and 2013 in (Bozkurt et al., 2015).

With the continuous growth of the Information and Communication Technologies, the eLearning has emerged to improve the learning experiences. It is a solution that allows the learners to fit learning according to their lifestyles, and offers the ability to share material in all kinds of multimedia formats and documents ... Today learners are using their smartphones to access the internet during the online courses. Different kinds of social media and various other means of online resources allow the learners to keep in touch and discuss among themselves course related matters.

This paper aims to present and discuss current, as well as future eLearning technologies in the higher education institutions and organizations around the world. Section 2 briefly describes the history of eLearning. Section 3 presents the evolution of the eLearning technology over the years to the current stage. Section 4 presents some emerging challenges and finally, section 5 concludes the research contribution.

2. Brief history

In the past, distance learning has been primarily used to provide students that could not follow their courses in schools. The course materials were delivered by post services and

relationships with tutors was via ordinary mail. In the earlier 1960's, the first generalized computer assisted instruction system was PLATO (*Programmed Logic for Automatic Teaching Operations*) created by the University of Illinois, using an ILLIAC I computer (thinkofit.com, 2016).

In the 1970′s, the introduction of graphical user interfaces using screen and mouse was the prelude to personal computers. The introduction of Internet for military purpose was the prelude to the World Wide Web.

In the 1980′s, eLearning expanded and individuals could learn about particular subjects with their computers at home. Online courses were developed by the New Jersey Institute of Technology and the University of Guelph in Canada (Mason & Kaye, 1989). By the mid-1980s, many college libraries started to make it possible to accessing course content directly. By the early 1990s several schools started delivering courses online dedicated to students who are unable to attend school due to geographical or time constraints. By 1994, the first online private high school, CompuHigh, has been founded and provided individual courses as well as accredited diploma program (compuhigh.com). In 1997, (Graziadei et al., 1997) described criteria for developing technology-based courses. In the 2000′s, the training providers explored the opportunities of the new technologies: web browsers, email, HTML documents, media players and low-fidelity streamed audio/video to extend the use of the eLearning in business. Workers improved their knowledge and skill sets and individuals accessed to programs to allow them to earn online degrees. The U.S Department of Education conducted a study in 2008 showing that during the 2006-2007 academic year, around 2/3 of postsecondary public and private schools were participating in student financial aid programs related to programs and courses offered by the distance learning means. 77% of enrolment in *for-credit* courses were oriented towards the online learning (degreedirectory.org, 2015). In the 2010′s, social media are taking more and more importance in many areas and it is the beginning of the social online learning using platforms such as YouTube, iTunes U, … while mobile learning and MOOCs are transforming the way learning is evolving.

Today eLearning has evolved to what is called the eLearning 2.0 (EL2). It is based on the advantage of the Web 2.0 applications in education. The Web 2.0 is the platform for the web supporting the collaborative learning where the user shares his learning content with other users through collaborations and the possible use of mobile media. eLearning 2.0 is also defined as the utilization of social learning as an educational tool (Conde et al., 2014 ; McLoughlin & Lee, 2011).

Web 2.0 applications are supposed to help learners to become more autonomous in their learning process.

Nowadays, eLearning has reached every education level, all over the world. It appears that "*the worldwide market for Self-Paced E-Learning reached $35.6 billion in 2011*" It should reach over $51 billion by 2016 (Docebo, 2014).

3. eLearning evolution

eLearning tools have evolved tremendously from the "old" CD-ROM media to personalized technologies that try to meet the learner's needs. This development has been mainly enabled by technologies like LMS (*Learning Management Systems)*, CMS (*Content Management Systems*), LCMS *(Learning Content Management Systems)*, virtual and multimedia communities, interactive boards, game authoring, and personalized tools. The evolution of eLearning content has been facilitated by advances in eLearning technologies, especially the mobile technology with dedicated mobile devices: handheld or palmtop devices, mobile phones, smartphones, personal digital assistants, tablets and the growing number of games consoles. Content development has been evolved from text based documents to multi-media supported and personalized content. Figure 1 illustrates the progression of network and eLearning technologies during the recent years.
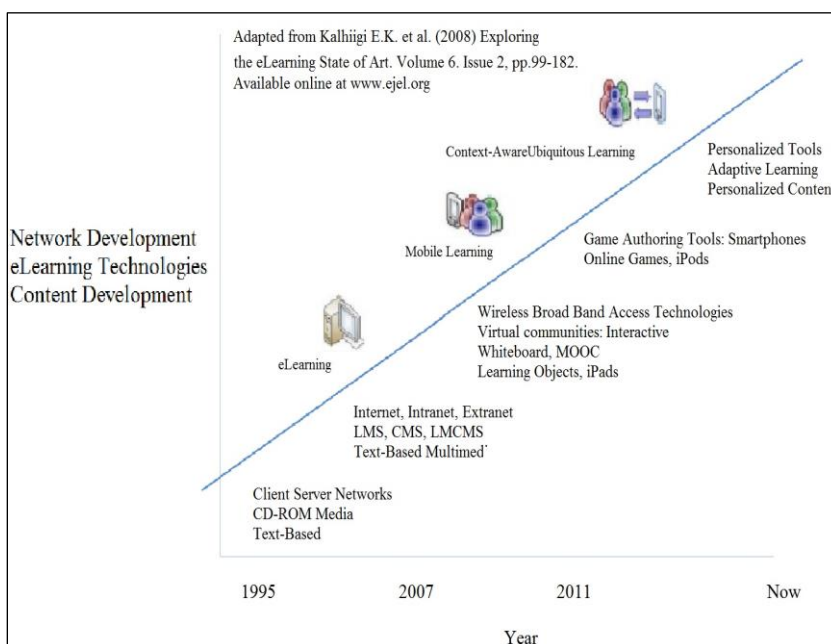

Adapted from Kalhiigi E.K. et al. (2008) Exploring the eLearning State of Art. Volume 6. Issue 2, pp.99-182. Available online at www.ejel.org

Context-AwareUbiquitous Learning

Personalized Tools
Adaptive Learning
Personalized Content

Network Development
eLearning Technologies
Content Development

Mobile Learning

Game Authoring Tools: Smartphones
Online Games, iPods

Wireless Broad Band Access Technologies
Virtual communities: Interactive
Whiteboard, MOOC
Learning Objects, iPads

eLearning

Internet, Intranet, Extranet
LMS, CMS, LMCMS
Text-Based Multimed'

Client Server Networks
CD-ROM Media
Text-Based

1995   2007   2011   Now

Year

Figure 1: Evolution of network, eLearning technologies and content development, *adapted from* (Kahiigi et al, 2008)

Table 1 summarizes the eLearning technologies deployed during the last and current years. They range from the CD-ROM media, passing through the Learning Management Systems (LMS), virtual worlds and multimedia communities, until the learning objects and game authoring technologies. According to (Cross, O'Driscoll and Trondsen, 2007), virtual worlds and multimedia communities are able to provide learning environments that stimulates learner's high order thinking and knowledge development. This have been also made be possible by using *learning objects*: digital resources reusable in different learning environments (Wiley, 2000). They may be seen as any things that may be offered for learning and can provide content that maybe used in many different domains and contexts. Several authors think that the current eLearning area should put emphasis on creating pedagogical technologies to support the authoring of such learning objects. Online games also can contribute to the development and enrichment of eLearning. They can help in creating social communities facilitating information and knowledge sharing and creation. This concept is usually called "*edutainment*".

Table 1: *eLearning technologies evolution*

Technology name	Definition	Examples
1 **CD-ROM media**	• Adopted mainly in the early 1990's; • "*Have been used to deliver learning material to students on distance programs*" (Gooley et al. 1994) • Supports learning content in different formats.	
2 **Learning Management Systems (LMS), Content Management Systems (CMS) and Learning Content Management Systems (LCMS)**	• Systems and processes contributing or learning and to the management of that learning. • Developed to provide online learning services for students, teachers, and administrators; • CMS are developed to facilitate the collaborative creation of content, organization, control and to manage the publication of documents in a centralized environment; • LCMS are web-based systems that combine the management and administrative functionalities of LMS and CMS to author, approve, publish, and manage learning content.	Blackboard and Sakai Moodle Macromedia Course Builder Joomla Drupal WordPress Xyleme Blackboard Kenexa
3 **Multimedia Communities**	• Incorporates multimedia content in eLearning environments; • For (Omwenga and Rodrigues, 2006) "*it is the online*	CSILE/Knowledge Forum is a tool that incorporates a multimedia community space and enables learners sharing

Technology name	Definition	Examples
	delivery of information, communication education and training providing a new set of technologies that can add to all the traditional learning modes-CD-ROM, and traditional computer-based training".	educational ressources. Youtube is also becoming a multimedia community for learners
4 Virtual worlds	• Become very popular by promising to facilitate learning. • They allow an enrichment of an educational experience adding fun (Klaila, 2001); • They also allow new learning experience where situations may be simulated and tested virtually (Hansson, 2006).	DVTS-Based remote laboratory across the pacific Over the Gigabit network; Web-based Activities around a Digital Model Railroad Platform; The Automatic Control Telelab: A User friendly Interface for Distance Learning A low-cost PC based Virtual Oscilloscope (Bhunia, 2004).
5 *Game authoring technologies*	• Enhance and facilitate the learning process using built-in interactions • Online games range from very simple text-based games to games incorporating virtual worlds implying many players simultaneously	ClassTools Edusim What 2 Learn ProProfs Brain Games These 4 tools allow to build interactive games that can be embedded into Web sites

4. Emerging challenges

Among the numerous fields that are gaining importance, 5 main emerging challenges having an impact on successful eLearning implementations are discussed in this section: new pedagogy and cognitive approaches, using ICT technologies to enhance teaching and learning, management support, gamification, massive open online courses (MOOC) and quality frameworks and standards for eLearning systems. These 5 five challenges are of general interest. More specific challenges, e.g. the one described for intelligent virtual laboratory for eLearning technology maybe found in (Munawar et al., 2018).

eLearning has deeply transformed the previous ways of teaching and learning. It has created new, and more flexible, approaches, more adaptable to the needs of the learners. New tools and technologies have improved knowledge storing methods and learning techniques. Within the eLearning context, advancement in different areas of computer technologies, such as network, databases, hardware and software, and, also content development, made it easier to create multiple content presentations, personalization and ubiquitous learning. Thus, many education organizations, at different levels, have introduced and adopted eLearning in their curricula.

However, there is a strong need for identifying suitable strategies and understanding the technology and pedagogy integration for effective eLearning implementations (Govindasamy, 2002 ; Kahiigi et al, 2008)."). (Otsetova and Kurtev, 2010) state that "*to realize that potential of eLearning as an open but cohesive system to support learning, it is essential that we rethink our pedagogy*". Furthermore, the adaptation of the eLearning system according to cognitive characteristics of the students is a relatively new direction of research on the conjunction of pedagogical aspects. Furthermore, (Hansson, 2006) advocates that "*the adoption of technologies in education has created new opportunities for interaction in teaching and learning activities*". Omwenga and Rodrigues. (Omwenga & Rodrigues, 2006) also pointes out eLearning systems to help learning in a agile environment and highlights how important it is to build interactive communities within eLearning environments. Indeed, eLearning allows to have an increased access to knowledge and interactive resources at all educational levels. On the other hand, there is a need to improve organizational processes associated with eLearning. (O'Hearn, 2000) confirms that "*university structures are rigid and unproven, regarding the incorporation of technological advancements*".

It is also important to put emphasis on the lack of design strategies adapted to the eLearning process and the evaluation of its success implementation in the higher education context. For this purpose, William Horton (Horton, 2011) provides a practical guide to the varieties of eLearning and a new content on games, social networking, and mobile technology. He guides the reader systematically though the decisions necessary to design effective eLearning and offers a course design process that builds up from small pieces to create full course including assignment examples.

Successful implementation of eLearning necessitates referring to pedagogical and cognitive aspects, through which learners acquire and retain skills and knowledge to facilitate their development (Hubackova, 2014). Different guidelines for consumers and designers of multimedia learning maybe found in (Clark & Mayer, 2016). In order to maintain the development of the many different areas of eLearning systems, sustainability requirements need to be identified as well. A "a systematic literature review and analysis" has been achieved by (Alharthi et al., 2018).

Significant changes have been accomplished in the area of teaching and learning development, in growing the individual and collaborative capacities of practitioners in the sector and in embracing new pedagogies, new technologies and new ways of listening to the voices of students and colleagues through quantitative and qualitative research (O'Farrell & Farrell, 2013). The design

strategies of the eLearning process (Hubackova, 2014) and the evaluation of its success implementation in the higher education context are also important issues to address.

The technology promotes the impact and value of the digital world for both teaching and learning. It must be seen as a tool for creative engagement and as an effective way of sharing content (O'Farrell & Farrell, 2013). It seems obvious that the level of computer skills for teachers and students has an impact on the effective use of different digital technologies to support online education. Relevant skills contribute to the effective learning process and confidence with comfort in using computers overcomes barriers to social interactions and motivation. (Miller et al., 2003) assert that "*[the] arguments against online learning often focus on what is viewed as negative impacts from not having face-to-face contacts and anxiety caused by the nature and quantity of information transmitted through technology*".

It appears that successful transitions to more flexible modes of delivery require full commitment from senior management to support and monitor strategic change (Scottish Funding Council, 2007). A growing emphasis is put on the quantitative tools applied to measuring student engagement, the impact of technologically mediated learning or the staff views on a range of issues relevant to them. It has also been outlined that the engagement of the all concerned people in the learning process is an important aspect, especially in some areas of learning, like in the multimedia area, the one that has been analyzed in (Farhan et al., 2018).

Gamification is another challenge. First coined in 2002, it is a "*new movement to create effect in non-game fields by applying game mechanics and game thinking that makes game fun not unlike points, level-up, ranking, achievements, competition, and reward.*" (Park and Bae, 2014). It is more and more used to promote motivation in different contexts and areas of education and learning (Pesare et al., 2016). A more recent study, in the same area, shows how to enhance student learning experience with technology-mediated gamification (Tsay et al., 2018).

Massive open online courses (MOOC) is a recent paradigm allowing anybody to enroll in online courses offered by the most known universities around the world. Most often, the registration is at no charge and no pre-requisite is demanded. (Bari & Djouab, 2016) describes a recent situation of MOOC and (Zhu et al., 2018) gives detailed information on empirical MOOC recent literature. One of the important challenge is the retention rate that is very low, around 10%. The topic of engagement and persistence has been well studied by (Jung & Lee, 2018) where as (Hone & El Said, 2016) explored the factors affecting MOOC retention. One can find a recent experience of designing

and running a MOOC on research methods in (Lee & Rofe, 2016). One of the main issue of MOOCs is their sustainability since the registration is usually free, at no charge. There is a real need for business models adapted to such particular situation (Bari, 2016).

The need for software quality frameworks and standards is more and more needed as "*Educational organizations need a good quality of the e–Learning applications to achieve the success in the exponential growing of these systems.*" (Bari & Djouab, 2014). There are already new proposals for such standards based on the customization the well-established ISO9126. Identifying novel quality characteristics for eLearning systems does this. "*The customization is done by extracting the quality characteristics of the web and e-Learning systems and adding them to the model*" (Djouab & Bari, 2016).

5. Conclusion

eLearning is an area in permanent evolution that continuously evolve with time and new research. This paper investigated its present situation. Starting from its definition and its history, the eLearning evolution has been presented. To conclude, some of the main emerging challenges have been discussed.

The main research limitation is due to the very large number of fields composing the eLearning area. To identify the emerging challenges, this paper focused only on 5 fields, namely new pedagogy and cognitive approaches, ICT technologies to enhance teaching and learning, management support, gamification, massive open online courses and, eventually, quality frameworks and standards for eLearning systems.

Many different challenges exist in other fields whose application to eLearning maybe of paramount interest in the near future, such as, for example, the Internet of Things (IoT), the Artificial Intelligence and the neuroeducation. These 3 domains constitute the scope of our future research in identifying emerging challenges related to eLearning.

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