Distance Education Initiatives Apart from the PC

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INTRODUCTION

Developed countries have long been interested in distance education. This interest is growing due to the advance toward a global economy, because education is commonly regarded as the best way to maintain a region's competitiveness. Thus, we have recently witnessed a great development of *e-learning* (taken as a synonym for Web-based learning, or learning through an Internet-enabled computer) to the point that using the Internet to deliver educational material has practically displaced the early initiatives based on postal mail, radio, or television.

The initial evolution of the Internet led to envisaging a massive adoption of e-learning solutions. However, as proved by data from Internet World Stats (http://www.internetworldstats.com), the penetration of the Internet in homes has been rather limited (around 35% in Europe and 67% in the USA), so it follows that the penetration of e-learning has been limited too. This is indeed one consequence of the so-called *digital divide*, that is, the separation between people who make frequent use of the information technologies and those who have no access to them or, even having access, lack the necessary knowledge to use them.

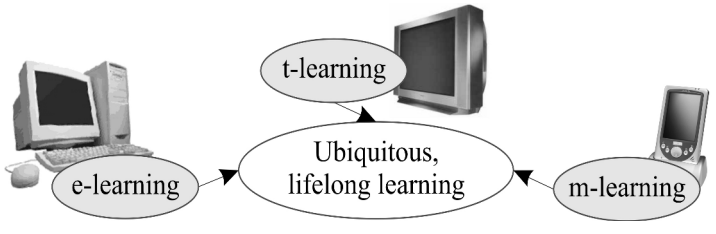
A divide in the access to technology can lead to inequalities in the access to knowledge and education, posing risks of social exclusion. To prevent that, public administrations have launched large-scale initiatives, like the *World Summit on the Information Society* and the *i2010 plan*, that aim at making technology available to everyone, at anytime and from anywhere. As a cornerstone, these initiatives promote the development of access platforms different from the PC, with special interest in harnessing the interactive features of devices that have attained greater penetration in society. This includes the new digital TV set-top boxes, which bear the term *t-learning*, and the modern mobile devices (e.g., mobile telephones and media players), which set the foundations for *m-learning*. The vision, as represented in Figure 1, is that the information technologies, combined with suitable pedagogical and andragogical approaches, will enable a scenario of ubiquitous and lifelong learning, freeing people from time and place constraints, and offering flexible learning opportunities to individuals and groups.

This article describes technical, methodological, and educational issues that make t-learning and m-learning substantially different from previous works on e-learning. We also review developments in both areas to finally discuss problems that may be the subject of much research in the near future.

BACKGROUND

Next, we discuss the evolution of the motivations and scopes of t-learning and m-learning. It will be seen that many pieces

Figure 1. Convergence of approaches to distance learning



of work have had disparate views of the learning paradigms that should be pursued over the new technological media.

Motivations and Scope of T-Learning

Television has been present in nearly every home for decades, getting to be so familiar that everyone feels comfortable using it. Thus, it may become an entry point to the information society, especially for the social sectors that are more reluctant to have contact with technology. Actually, the idea of using the television for educational purposes dates back to the 1950s, but its potential to disseminate knowledge remained underexploited. However, the advent of interactive Digital TV (IDTV) by the late 1990s opened an unprecedented range of possibilities, which made Lytras, Lougos, Chozos, and Pouloudi (2002) predict that "the possibility of broadcasting data and interactive applications jointly with the audiovisual contents will have far-reaching implications in education." T-learning then arose as an approach to exploiting the advances in IDTV technologies to deliver interactive applications that would promote learning and problem solving by requiring active involvement from the viewers (Zhao, 2002).

At first, there were discrepancies regarding the very conception of t-learning, with two opposite perspectives.

- On the one hand, some authors (Russell et al., 2004) argued for simply providing an interface to the same e-learning services running on the Internet, porting existing solutions to a new execution platform (the IDTV set-top box).
- On the other hand, as noticed in Pazos-Arias et al. (2006), most of the experiences launched up to 2005 merely consisted of adding interaction capabilities to the TV programs, promoting the concept of "edutainment" (education and entertainment).

The first approach has been practically abandoned for neglecting various IDTV-specific features that advise against making t-learning a direct translation of the models devised for e-learning (Lekakos & Chorianopoulos, 2006). First, there are technical factors like the limited interactivity achievable with a remote control, the reduced amount of text that can be readable on a TV screen, or the low computing power of a set-top box. Furthermore, it is clear that many potential IDTV users have a lower level of predisposition to learn new technologies than Internet users. Finally, the many years of analogue TV have consolidated a passive attitude from the users, plus a conception of television as an entertainment medium. Thereby, as claimed by the second approach, it is now accepted that an effective t-learning strategy should lean on entertainment to lure people into education, and deliver interactive applications that guide the users through audio and video contents (Chorianopoulos & Lekakos, 2007; Trindade, do Vale, & Pedroso, 2006). Notwithstanding, the kind of edutainment envisaged at first has evolved into two distinct philosophies in the design of t-learning services, which may be seen as the reverse of one another.

- By *pure edutainment* (meaning education that entertains), we now refer to educational services whose central axis is a TV program, enhanced with interactive learning elements that furnish pedagogical added value.
- The term *entercation* (entertainment that educates) refers to educational services designed around an interactive learning element that is supplemented with audiovisual material for the sake of amusement.

In sum, we can delimit the scope of t-learning halfway between the mere entertainment provided by the TV programs and the formalities of e-learning. Interactivity provides a major advantage with regard to the traditional TV programs because it makes the learning experience more engaging, for example, by letting the user influence the presentation of contents, evaluate his or her knowledge through assessment tests, participate in competitions synchronized with TV shows either individually or as representative of a group (Sperring & Strandvall, 2006), and so forth.

Motivations and History of M-Learning

Grounded on the requirement to have the learners in front of the PC, the e-learning models cannot meet the requirements of the modern lifestyle. M-learning arose to embrace the initiatives that harness the educational possibilities of mobile devices that have attained massive penetration in society, like mobile telephones, media players, and PDAs (personal digital assistants). The vision is common that mobile computing will enable the greatest level of time and space flexibility, together with unprecedented possibilities to adapt to individual learners' needs. However, this idea has borne disparate realizations.

The first m-learning developments focused on providing access through mobile telephones to existing e-learning platforms using technologies like wireless application protocol (WAP) to browse hypermedia and short messaging system (SMS) to deliver textual notifications (Garner, Francis, & Wales, 2002), and using specialized navigators and e-mail (Savill-Smith & Kent, 2003). In general, there were no attempts to think of m-learning as a distinctive approach, and research focused on technical issues like delivering content over wireless networks (Vedula & Han, 2003), adapting content and interfaces to make the same courses accessible through different devices (Bandelloni and Paternò, 2004), or maintaining the learning activities during periods of disconnection (Trifonova & Ronchetti, 2005).

In a posterior stage, many claims arose from the educational community to develop m-learning more from the