E-learning, Usability and Accessibility: a systemic synergy for web based training

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Abstract (Fr.)
L'e-learning est une stratégie, nouvelle et ayant du succès, pour l'exploitation du World Wide Web. Sa introduction a engendré des rapides et profonds changements dans l'apprentissage et l'enseignement. Toutefois, les logiciels et les environnements actuellement utilisés dans ce domaine n'aident pas les étudiants à apprendre plus et mieux que dans les contextes d'apprentissage traditionnels. Cette circonstance produit la faillite de la plupart des courses d'e-learning. La raison pour cela peut être trouvée dans la stratégie d'élaboration de l'information par l'usager et dans la faute d'études sur l'évaluation des modèles cognitifs du processus d'apprentissage, qui sont à la base des projets des logiciels actuellement utilisés. Le but de ce travail est de mettre en évidence des facteurs émergents dont la synergie pouvrait garantir des bons projets éducatifs basés sur le Web et intégrant l'accessibilité, l'employableté et les outils de la connaissance.

Abstract(En.)

E-learning is a new and successful strategy to develop knowledge by exploiting the World Wide Web. Its introduction is generating fast and deep changes both in learning and teaching. Nevertheless, the educational software and environments actually in use in this domain did not help students to learn more and better than in traditional training contexts. Such a circumstance lead to a failure of many e-learning courses. The reason for the latter could be found both in user's information processing strategy, and in a lack of evaluation studies concerning cognitive models of human learning process underlying the design of software actually in use. The aim of this contribution is to highlight some emerging factors whose synergy could guarantee a good web-based education design, based on the integration of accessibility, usability and knowledge tools design.

1. Introduction

Distance Learning is a new area of investigation for HCI (Human-Computer Interaction) researchers, that, despite its short history, requires a deep knowledge about the complex interrelation between cognitive factors and the special nature of human-machine interfaces in educational process. The difficulty in achieving such a knowledge had so far as a consequence an underevaluation of the role of User Model in e-learning design. In turn, the latter has been the main cause for the lack of performance and the failure of many e-learning projects. This problem has been stressed by many authors (Najjar 1996, Byrne 1996, Hansen 1998, Tselios et al. 2001, Costabile et al. 2005) which remarked the absence of meaningful differences between web-based learning and traditional training. This is due mostly to the fact that a reliable evaluation methodology for e-learning applications does not exist yet (Costabile et al. 2005). Moreover, this field is characterized by quick technological changes and high costs for design. On the other hand, User Centred Design plays a fundamental role in determining the success of e-learning: if the system is not usable, students are forced to spend time and cognitive resources to learn its functions and the involved attentional resources are lost without any content elaboration, (Costabile et al. 2005). We claim that, to solve this problem, we must resort to Learner Centred Design principles, which establish a bridge between usability, accessibility and distance learning tools (Squires et al. 1999): if the user is involved in every phase of design, this will allow to learn and to apply the Human Computer Interaction principles and to reduce the evaluation costs. The main idea is that only a team work could go beyond merely technical aspects or educational issues, so as to produce a good course: e-learning design asks for specific competences, time resources and energies to

guarantee a high quality level (Cerra 2003, Penna et al. 2003). In this regard, the aim of this contribution is to highlight some factors whose integration could guarantee a good e-learning educational design: accessibility, usability and knowledge tools devices.

2. Aspects related to course's accessibility and usability

The evaluation of e-learning tools must start from a careful assessment of accessibility issues. This implies a special attention to people who experience difficulties in seeing, hearing, moving, or are unable to process easily some kinds of information, who have difficulty in reading or understanding texts, who are not able to use a keyboard or a mouse, who own a text-only or a small screen, or a slow Internet connection, who do not speak fluently or understand the language in which the documents are written, who have an old version of the web browser (i.e. not supporting frames), an entirely different browser, like a voice browser, or a not widely used operating system. Through W3C guidelines, WAI (Web Accessibility Initiative) explains how to make Web content accessible to people with difficulties or disabilities. However, while following them, we will also make Web content more easily accessible to all users, whatever user agent they use or whatever constraints they maight be operating under. The guidelines address two general themes: ensuring graceful transformation, and making content understandable and navigable. They stress the need for respecting three main priorities:

1) a Web content developer must prevent one or more groups of users from finding it impossible to access information in the document;
2) a Web content developer should prevent one or more groups of users from finding it difficult to access information in the document;
3) a Web content developer may prevent one or more groups of users from finding it somewhat difficult to access information in the document.

If accessibility can be only a question of machine code, usabilty refers to "a web site's ability to suitably meet learners' goals with satisfaction, ease and effect, by making provisions for useful interactive experiences via a tool that provides high quality utility and optimal learnability"(a definition available at *http://www.tafefrontiers.com.au/TF_Usability/files/reseach_paper.pdf*). This is the aim of Learner Centred Design: know how learners prefer to learn, understand their motivation or incentive to engage in online learning, what are their needs or how they feel comfortable when using online applications (Miller 2005). It is necessary to know what are users' experiences with e-learning.

Furthermore, a good design should (Norman 1995):

· be interactive and provide feedback,
· have specific goals,
· motivate, communicating a continuous sensation of challenge,
· provide suitable tools,
· avoid any factor of annoyance interrupting the learning stream.

Design of course's interface is critically important (Jones 1994), because it has a positive or negative impact on user performance (Tselios et all 2001). Then it is desirable to:

- Use screen-friendly fonts and web-safe colours in order to create a standard consistent look,
- Provide quick download times and help users by providing printer-friendly pages,
- Take into account that learners are sensitive to the readability of on-screen text; therefore formatting and spacing of the text as well as colours are important; moreover a common look helps users to distinguish course pages from external linked hyper-pages; people do not like studying texts from the screen and they do not want to go more than three clicks far from the main page, so they need a navigation frame always available; learners are always in search of something new inside the web; it is important to update frequently contents and news and also give a direct indication of what is new as soon as possible (Van Rennes et al., 1998).

From an adaptation of Nielsen's heuristics by Squires and Preece (1999), we propose to provide:

- a match between designer and learner models;
- navigational fidelity;

- appropriate level of learner's control;
- prevention of peripheral cognitive errors;
- understandable and meaningful symbolic representations;
- support to personally significant approaches to learning;
- strategies for cognitive error recognition, diagnosis and recovery;
- match with the curriculum.

Actually evaluation methods for e-learning courses are based on usability heuristics, but the latter does not produce a de facto standard neither for usability itself nor for distance education. If this situation does not change, e-learning could not support formative aims in a different way with respect to traditional education, and therefore would not allow for freedom from both spatial and temporal constraints.

3. Conclusions

An old problem of every educational technology is the quality assessment of efficient services and the effective achievement of educational goal. Probably the usability and accessibility could be the basic parameters for the evaluation of e-learning applications (Zaharas 2002). Unfortunately, there is a lack of usability studies related to distance education and moreover field studies and observations are expensive. There is clearly a need for a sets of heuristics or guidelines such as for the accessibility field.

A good instructional design can advantage learners in having a successful and enjoyable experience, but this is possible only if the educational tools do not become a frustration barrier (Smulders 2001). To this aim HCI, educational experts and designers must collaborate to understand how to plan a Learner Centred Design.

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