Accessibility in Health related Virtual Learning Environments

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I. Introduction

Supporting patients and informal carers is an essential task in managing chronic diseases. Many of these diseases are either directly linked to disabilities or are age related and, thus, also strongly correlated with potential disabilities. Furthermore, as the population ages it is becoming more and more common to give an old person with a set of mild disabilities acting as informal carer of another person with some type of chronic disease.

Support material and professional help can be provided through the use of an eLearning platform. These platforms are usually known as Learning Management Systems (LMS) or Virtual Learning Environments (VLE). People with disabilities, linked to physical and/or cognitive impairments can obtain an extraordinary advantage from access to eLearning but, in practice, they find important barriers when the Virtual Learning Environments (VLE) and contents are not delivered in the suitable adapted forms according to their needs and preferences.

All VLEs are supported by a set of different technological layers. Those layers can interfere with the final user gaining access to such adapted resources. Conflicts with user agents, assistive technologies and the delivery format of the resources are the most common problems.

The accessibility of current VLEs, a mature technology, provides an interesting case study regarding the types of problems that can be encountered by users in current web applications", (Power et al, 2010).

II. Accessibility Evaluation

In order to evaluate if a service or environment is accessible to as many people as possible it is necessary to undertake accessibility and usability verification.

A basic evaluation could be based on automated checking of conformance to guidelines and standards. In some cases these are implemented as legislation, e.g US rehabilitation act Section 508, and in others as standards like ISO9241 or W3C Web Accessibility Initiative guidelines.

The use of guidelines to accomplish accessibility evaluations is widely discussed in literature. Many authors (Kelly et al., 2005)(Sloan et al., 2006)- agree that the development and promotion of guidelines for Web accessibility has been fundamental to the increase in prominence of Web accessibility and find guidelines particularly effective as a basis for automated assessment of those accessibility barriers that do not require human inspection. Other authors (Nielsen, 2005)- criticize the guideline-based approach for having significant shortcomings.

As a matter of fact, researchers have found Web sites that rated highly on user performance and acceptance measures, yet which did not conform to some high-priority WCAG checkpoints. Equally, there is also evidence that accessibility guidelines can be applied literally without consideration of the impact of the solution on usability for disabled people (Thatcher, 2003). This was specially the case before the development of the WCAG 2.0 as the previous version of this guideline was based on checking a set of very specific criteria that were not always adapted to the diversity of the real users and the very fast technology changes that are typical of internet based services.

Finally, one well proven method to improve universal access is by involving final users during the whole design cycle. However it is clear that this is the most expensive approach. Although it is recommended by many authors e.g. (Wattenberg 2004)-, it also has are several challenges. Apart from cost, user recruitment (Petrie et al., 2006) and representativity are also problematic. .

III. Accessibility Guidelines

There are several specifications and guidelines to be considered in order to promote accessibility in VLEs:

- W3C Web Content Accessibility Guidelines WCAG 2.0 (W3C WAI, 2008)
- W3C Authoring Tool Accessibility Guidelines ATAG (W3C ATAG, 2000)
- W3C User Agent Accessibility Guidelines UAAG (W3C UAAG, 2008)
- IMS Guidelines for Developing Accessible Learning Applications GDALA (IMS GDALA, 2002)
- IMS Learner Information Package LIP, and Access For All v2.0 (IMS LIP, 2002)
- ISO FDIS 24751 Accessibility standards (ISO FDIS 24751, 2008)
- Section 508 of the US rehabilitation act. For our purposes this is very similar to the W3C WCAG requirements.

In such a complex scenario, it would be useful to know which are the guidelines, specifications and standards to be used in every learning phase. The main applicable

specifications and guidelines are further explained in the next subsections of this paper.

A. W3C General Accessibility Guidelines

The W3C Web Accessibility Initiative (WAI) mission is to develop strategies, guidelines, and resources to help make the Web accessible to people with disabilities. As VLEs, which are our main element to support patient and carer training, include most of the major tasks on the web, WAI guidelines suit the usability and accessibility analysis needed by eLearning containers and contents.

One of the guidelines that is more useful for our objectives is the Web Content Accessibility Guideline (WCAG). This guideline groups recommendations into the goals of developing perceivable, operable, understandable and robust web contents. Nevertheless, in the case of training systems there seems to be an implicit request to enlarge the scope of the accessible concept because guidance to teachers was found to be mainly targeted towards technical (Bel et al., 2008: 1028).

B. IMS Specifications and ISO Standard

As mentioned above, in 2010 IMS published two documents based on ISO/IEC specifications (IMS GDALA, 2002) and (IMS LIP, 2002) which were based on previous releases of IMS Access For All.

The first of these documents, Resource Description Information Model (IMS A4A, RDIM, 2010) focuses on the definition of a platform independent model (PIM) that provides a common language to describe digital learning resources to facilitate matching these resources to the learners' accessibility needs.

Access For All specifications assume that the eLearning content is compliant with basic accessibility specifications although in 2002 IMS GLC also published their own Guidelines for Developing Accessible Learning Applications that highlight existing solutions in order to provide a framework for the distributed learning community.

Some state of the art work has been undertaken to implement compliant tools, such as “ATutor”.

IV. Accessibility for VLEs

In order to study the Accessibility and Usability of real world VLEs, there are some key issues which should be thoroughly considered, (Martin et al., 2007):

1. VLEs are complex systems, which have to meet some specific requirements:

(a) to be flexible enough to address a variety of teaching styles, interaction preferences and devices; (b) to offer a wide range of configuration options; (c) to comply with educational standards –e.g. IMS, SCORM-,.

2. Accessibility and usability evaluations must be planned ahead for the entire eLearning Lyfe Cycle.
3. When evaluating the overall accessibility and usability of VLE, three different elements must be taken into account: the platform, where the course materials are stored and delivered; the packaged course materials, and the content generated by users.

It is important to understand that there are mainly two methodologies for obtaining accessibility data about VLEs: survey and interview approaches (Hersh, 2008), and empirical analysis (Power et al., 2010).

V. VLEs accessibility analysis results

There are not many studies VLE accessibility despite its importance for universal access.

In a general study (Dunn, 2003) higher education stakeholders were asked to answer an online questionnaire and its results were used to plan a series of in depth interviews. It is interesting to remark that fifteen percent of respondents considered accessibility as a criterion to be 'considered but not primary' for their choice of VLE.

A more recent study about VLE accessibility (Power et al., 2010) analyzed three commonly used VLEs: Moodle (version 1.9), .LRN (version 2) and Blackboard (version 8). A double approach was undertaken.

First, a heuristic evaluation of these tools based on [WCAG 1.0] guidelines was carried out. All systems included violations in all the priority levels. Blackboard got the worst accessibility results but the differences were not very significant

A second step was an end user evaluation using the same VLEs. Four blind, screen reader users, were asked to undertake a set of defined and representative tasks in the VLEs. The results of this experimental study match with the guidelines evaluation in most cases. For instance, participants struggled with Blackboard more than with .LRN or Moodle. However, in general Moodle and .LRN are better rated in this second evaluation than in the first one.

The main outcomes concerning general VLE accessibility and usability issues from (Power et al., 2010) are:

- There are serious accessibility issues related to the use of virtual learning environments in current practice. Even though only a small subset of WCAG 1.0 checkpoints were tested on a small subset of tasks the tested VLEs did not pass even the lowest compliance level
- Each tested VLE had accessibility problems that did not allow some users to continue without external help when they were performing some of the basic tasks.
- There is a need to educate the individuals developing, deploying and procuring these environments about accessibility and which criteria to apply when adopting a VLE.

- There is a clear need to examine accessibility in VLEs looking at the industry's attitudes.

In order to complete and update the analysis of VLE accessibility a survey has been undertaken in the framework of the CARDIAC EU (CARDIAC 2010) project. As a result of the analysis above it was decided that to get VLEs that could be realistically used as training systems for chronic disease patients and informal carers industry would have to embed accessibility into VLEs and they should be able to interact with common assistive technology. These reflections lead us to the question that we wanted to answer: "What mechanisms would ensure successful integration of accessible and assistive ICT products, services and standards in VLE and eLearning?". The result led to the following conclusions:

- To have a successful accessible VLE (or any other accessible web app or service) it is essential that accessibility be built into the web design tools.
- The role legislation (push or pull) will play in the future of accessible systems can´t be underestimated.
- It is essential that the designers and end users are aware of the fact that users with some disabilities will be using the system. Even with the best automatic tools awareness of this situation is important.
- The trend of accessing internet based services through many different devices, which requires all kind of contents to be accessible through them, presents a clear opportunity, as well as a challenge, for accessibility.
- Many experts considered that it is not possible to go in a single step from the current situation to fully accessible systems. In the case of chronic disease patients and older trainers the support system should at least contemplate the situations that are more common. E.g. it is clear that to support patients with diabetes the system should be accessible by low vision and fully blind users.

VI. Conclusions

VLEs represent a very good alternative for building training support systems for chronic disease patients and their informal carers. However, due to the characteristics of the target users accessibility is an essential requirement for these systems.

Our study analyses through literary revision and expert's interview the situation of several common open source and proprietary VLEs. From this analysis we conclude that current VLEs are not fully suited for our intended target groups but solutions to ensure at least accessibility for selected target groups can be implemented using them.

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