Case Study: The Use of Brazilian e-Government Websites by Blind People

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***Abstract*—During the last decades, the use of Web systems has grown increasingly fast, becoming a trend and also a necessity for all. Nowadays, users need to exchange information and collaborate with others by means of virtual services. This is somehow crucial for people with disabilities, once the use of technology can turn the daily activities easier, or even make them possible. Despite this importance, Web accessibility is still not a reality for all. Most of the Web accessibility evaluation methods are based on manual or automatic verification of the code using WCAG or e-MAG (in the Brazilian context) accessibility standards. Despite of the importance of these guidelines to achieve Web accessibility, some researchers point out limitations in the evaluation methods purely based on technical aspects of code to generate Web content. The main objective of this research is to perform an empirical case study inspired by usability tests and ethnographic practices to be carried out with blind users while they are browsing e-government websites. The practical results expected from this study are new accessibility guidelines and/or an accessibility checklist that will be used in an evaluation method of Web accessibility and usability. The innovative aspect of this study is to consider human factors in the elaboration of e-Government accessibility guidelines, i.e., going beyond technological factors. This work aims at contributing in the promotion of digital inclusion of people with disabilities.**

Keywords—accessibility; usability; blindness; HCI; WCAG; e-Government.

I. Introduction

In the last decades, the use of Web systems had grown increasingly fast, becoming a trend and also a necessity for all. Nowadays, users need to exchange information and collaborate with others by means of virtual services. This is somehow crucial for people with disabilities, once the use of technology can turn the daily activities easier, or even make them possible. Despite this importance, Web accessibility is still not a reality for all [11].

Brazil has about 45 million people with disabilities. Among these, people with visual impairment are over 6.5 million, and among them, 582,000 are totally blind [6]. In attention to this group of people, Brazil has signed and ratified the United Nations Convention on the Rights of Persons with Disabilities, as well as it has a specific law to ensure the rights of people with disabilities [5]. Article 63 of the Law on Inclusion of People with Disabilities states that accessibility in Brazilian websites is mandatory. In addition, since 2004 Brazil has a decree-law determining that all e-government websites should be accessible [4].

In order to promote accessibility in websites, W3C (World Wide Web Consortium) launched in 1997 the Web Accessibility Initiative (WAI), which published a set of guidelines. Among these guidelines, the best known is WCAG (Web Content Accessibility Guidelines), a set of recommendations to create accessible Web content [15]. Nowadays WCAG is recognized as a de facto international standard for Web accessibility, despite it is not being used in the majority of existing websites. Considering the Brazilian context, the local government built its own accessibility model named e-MAG (Electronic Government Accessibility Model) [9]. e-MAG was developed in 2004 based on the study of 14 accessibility standards from other countries, and it is compatible with WCAG. In summary, it is a specialized version of WCAG for Brazilian e-government. Both of them, WCAG and e-MAG are in essence technical approaches.

Despite these efforts, a statistical study about e-government web sites in Brazil conducted in 2011 points out that less than 5% of these websites were complied with e-MAG 2.0 [16].

This article reports a work in progress that aims at creating an accessibility evaluation method that goes beyond the technological aspects of Web content, considering also human factors. The rest of this article is organized as follows. Section II discusses some limitations of the pure technical approaches of WCAG and e-MAG. Section III presents a case study to be conducted with blind people in order to investigate their strategies of use and learning in the Web. Section IV covers the next steps of the study and future work, concluding the article.

II. Problem Statement

Most of the Web accessibility evaluation methods are based on manual or automatic verification of the code using WCAG or e-MAG (in the Brazilian context). Both standards are based on a set of recommendations to be followed with the objective of achieve Web accessibility. According to Bach et al. [2], any of them will yield similar results in terms of accessibility.

Although it is important to follow these guidelines to achieve Web accessibility, some researchers point out limitations of evaluation methods purely based on technical/codification aspects. Some issues related to these limitations are:

1. The existence of too many rules and techniques, which are difficult to be understood by non-specialists;
2. Some rules can not be automatically checked, such as those related to the use of simplified and clarified language and textual description on images and videos;
1. The necessity to keep pace with the arrival of new Web technologies [14];
2. Lack of expertise in accessibility among Web developers;
3. Ambiguity in guidelines interpretation can cause problems in the evaluation, such as false positives, preventing the identification of the real problems;
4. Lack of empirical evidences showing that WCAG compliance makes pages indeed more accessible [10];
5. To fully ensure compliance with the guidelines, user agents (i.e., Web browsers and Assistive Technologies such as screen readers) should also be compatible with the resources used in the Web content; and
6. The guidelines are expressed in a way that does not take into account the variations in the context of use [7].

Given these limitations, we believe that it is essential to take the user experience into consideration as a complement to the evaluation of the Web accessibility based on purely technical guidelines. This study focuses on totally blind users, because we believe that blind people are most severely impacted by accessibility barriers, as Web browsing is strongly based on visual information. The experience of users with visual impairment has already been considered in several related studies on Web accessibility evaluation [1] [8] [11] [12]. However, this study introduces a novel focus, which aims at learning how the blind users browse the Web sites, by including extensive practices with users. Acquired knowledge will be used to develop a set of accessibility guidelines and/or accessibility checklist that will be part of a Web accessibility evaluation method in the next steps of this research.

III. PROPOSED CASE STUDY

The main objective of this research is to perform an empirical case study inspired by Web usability tests and ethnographic studies adapted to be carried out with blind users. The usability tests consist in a list of tasks to be executed in e-government websites (".gov.br" domains). The e-government websites were chosen because since 2004 it is mandatory that they must be accessible by people with disabilities [4].

The proposed empirical study will be conducted as an ethnographic case study [17]. In order to do so, tests will be held in the volunteer's premises and in his/her own house or work place. We aim to maintain the users' environment during the tests, such as computer, operating system, software tools, browsers and Assistive Technology to access the computer. The researcher will observe the task execution, interfering as little as possible. The object of this study is the context of use of the websites by blind users, and the collected data will be analyzed qualitatively and quantitatively [3].

The study methodology will follow these steps:

1. *Invitation*: First of all, a group of 8 to 12 blind adults will be selected and invited to participate as volunteers of this study. Volunteers should have at least one year of experience with the Internet and use of any Assistive Technology for blind people, such as screen reader or Braille display [13]. If the invitation is accepted, the volunteers must sign a commitment agreement, after that a pre-test interview will be scheduled;
2. *Interview*: The pre-test interview aims at collecting personal data to set up the volunteer profile and also to capture information about the way the volunteer uses the Internet, preferred websites, main barriers found during Web browsing and other issues. The interview consists in a semi-structured questionnaire with open questions, and it will be recorded and transcribed for later analysis.
3. *Usability Tests*: The usability tests will occur according to the users' preferences, in a well known environment agreed with the volunteer. These tests consist in executing a list of tasks in pre-defined e-government websites. During the tests the researcher will observe, take notes, and interfere as little as possible. The tests will be recorded using a camera. Collected data will be considered later on, during the data analysis step.
4. *Questionnaire*: After perform the usability test, a short questionnaire will be applied to the users aiming to identify the level of accessibility barriers found in the selected e-government websites. The questions will be prepared in such a way that the results could be ranked and should provide quantitative data.
5. *Focus Group*: Some of the volunteers will be selected and invited to attend to focus group meetings. During these meetings the researcher will act as the moderator, and the group will discuss difficulties and possible solutions to avoid the accessibility barriers.
6. *Data Analysis*: The last step of this study is the data analysis. The data gathered during the study, including interview transcriptions, annotations, usability tests recording, answers to the questionnaires and others, will be analyzed in a participatory way. All collected data will be classified and grouped according to its similarities. User profiles will be used to cross-check whether there is any correlation between use modes and profiles' characteristics. The quantitative data will be used to provide statistical information. The reported difficulties and possible

solutions to them will be ranked and discussed. Qualitative data, such as volunteer's feelings and comments will be used to qualify quantitative information.

The expected result of this case study is a rich mass of data with information about the way that blind people access Brazilian e-Government websites, including navigation mode, search mode, problem-solving strategies, among others. Data will be analyzed collectively looking for common characteristics that can promote the development of new guidelines and/or verification checklists to be used in the evaluation of accessibility and usability of websites. The innovative aspect of this study is to consider human factors in the elaboration of e-Government accessibility guidelines, i.e., going beyond technological factors.

IV. Conclusion

This papers reports a work in progress. The research project was submitted and approved by a research ethics committee. A group of possible volunteers was already selected and invited to participate in the test. A pilot test was already conducted with one volunteer, and its results will be used as feedback to improve the methodology.

The practical results expected from this study are new accessibility guidelines (or checklist) that can be used in an evaluation method for Web accessibility and usability. This result is of great importance for building accessible e-Government websites, providing a more inclusive environment for people with disabilities, especially blind people.

As other results of this research, we expect to: 1) Execute empirical evaluations of e-government websites used in the test scripts; 2) Contribute to the improvement of usability and accessibility evaluation methods; and, 3) Disseminate knowledge about Web accessibility, aimed at promoting digital inclusion of people with disabilities.

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