

EVALUATION OF WEB ACCESSIBILITY: A STUDY AIMED FOR USERS WITH CEREBRAL PALSY

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ABSTRACT

Cerebral palsy is a special condition that can lead to inability, difficulty or lack of control in the use of muscles and in certain body movements. These conditions for a long time stigmatized their victims as invalids and consequently resulted in their social exclusion. There are many tools available to help these people become part of regular society. Blogs, initially web pages aimed mostly to a young audience, are nowadays important tools in the social inclusion of cerebral palsy victims. New hardware and software technologies provide a substantial contribution to improve blogging by users with cerebral palsy. To turn the blog into a facilitator in the improvement of users with cerebral palsy, it is necessary to assess the accessibility and usability of systems so as to provide system designers and information architects with the guidelines to help them in developing tools and systems with universal accessibility features. The current study makes use of an exploratory qualitative methodology to collect enough data to support the desired results and purports to explore the difficulties and behavior of the users participating in the study, as well as to search a system that can help in the socialization of this user group. The results produced by the study show that there is still a lot to be done to make some of the hardware and software accessible so that they can be used independently by more users with cerebral palsy.

KEYWORDS: Cerebral Palsy, Web Accessibility, Social Inclusion.

1. INTRODUCTION

Cerebral palsy is a retardation in neuro-psychomotor development, with sequels in an individual's motor control and posture. The problems caused by paralysis can manifest themselves in different ways, as they depend on which part of the brain is impaired. There are no two identical cases. Some cerebral palsy victims show small, almost imperceptible alterations in the way they gesticulate, for example. Others may show more serious damage, such as not being able to move and speak, being almost totally dependent of others in their daily tasks [Oliveira *et al.* 2004]. The variability of problems for users with cerebral palsy is a challenge in the development of computer resources, with economic consequences in the development of systems, which must be almost totally crafted in a manual way. This complexity makes hardware and software development much more expensive, a complicating factor in the socialization of these users, since the acquisition of these resources can substantially help this process [Conforto e Santarosa 2002].

Due to these characteristics blogs can be used by users with cerebral palsy. Besides bringing about a more autonomous way of communicating, blogs can help to cover the deficiency of computational resources, especially more affordable blogs designed for cerebral palsy victims. [Tijiboy *et al.* 2002]. The blog can also be used as a support tool to educational methods in Collaborative Apprenticeship [Marques *et al.* 2010], as a system that allows interaction among users and stimulates reading and writing. Blogs can be used to post messages, images and videos among other available services. Therefore, the use and publishing of blogs can involve and enable a user in a virtual environment, thereby socially including this user. However, it behooves to analyze whether this system is accessible to persons with cerebral palsy [Ribeiro *et al.* 2010].

This study aims to analyze the web accessibility and usability of blog publishing systems. The analysis includes reporting the experience of participating users with cerebral palsy suffering from motor dysfunctions in their upper limbs. Based on the study of automatic evaluators and on the study of users, the study also aimed to create a list with recommendations of accessibility and usability directed to the developers of blog publishing systems. This list can contribute to guidelines for the improvement of access to users with cerebral palsy and, more specifically with motor deficiency in their upper limbs.

2. ACCESSIBILITY AND USABILITY

Accessibility consists in offering autonomy to individuals, when physical, mental, cultural or social conditions are not favorable. Therefore the objective is to make sure that access to places, services, transportation, means of communication and Information Technologies is available to all, without distinction, even if a special interface is needed. Web accessibility or e-accessibility means universal access to the World Wide Web component, or simply Web [Leal Ferreira *et al.* 2007].

Usability refers to the facility of how an a user, with or without difficulty, can perform a task, whatever it is, resolving issues regarding the efficiency of use, ease of learning, ease of memorization, tolerance for errors and satisfaction. Although closely linked and interdependent usability and accessibility are essential to provide users with difficulties with the ability to use the web independently [Santos 2008].

In trying to offer more means of accessibility and usability for users with disabilities, many research studies of hardware and software were undertaken. Some of these studies cover the development of so-called assistive or adaptive technologies, whereby these tools and resources are intended to offer new facilities or to increase the capabilities of existing ones, such as the walking stick, the wheelchair, special keyboards and screen reader programs for example [Heidrich and Santarosa 2003]. Due to cost, some of these resources are the privilege of a few, but substantial efforts are being expended to make them more affordable.

There are several proposals for web accessibility guidelines aimed at making web systems more available for most people, or less difficult to operate or simply to improve them, such as: Web Content Accessibility Guidelines (WCAG 1.0 2.0), proposed by W3C (World Wide Web Consortium) and the Brazilian Accessibility Model (e-MAG). The WCAG 1.0 [Chisholm *et al.* 1999] was chosen, since it is used by the automatic validators selected for this research and the WCAG 2.0 [Caldwell *et al.* 2008] was not ready when this research was started.

3. RESEARCH METHOD

The present research, of an exploratory character, presents three stages: i) face-to-face ethnography; ii) on-line ethnography; and, iii) study of multiple cases. The first two stages were intended to make us aware of the difficulties and behavior of the users in the study, as well as to choose an adequate web system to contribute to their socialization. The third stage was used to evaluate the selected web system based on web accessibility and usability aspects. Both studies were performed from October 2008 to June 2009. No tasks were given to the participants to avoid bias in the research [Preece *et al.* 2005]. The studies of multiple cases were performed in October 2009 and December 2009, and this time the participating users had to execute some tasks. However both studies had an observational style.

Limitations: Not all existing blog publishing systems were analyzed, and perhaps some important ones were left out. Nor is it possible to take in account all types of cerebral palsy due to the variety of sequels. It was also not possible to evaluate users utilizing some type of assistive technology, whereby the majority was able to adapt to the available devices, such as the traditional keyboard and mouse. Before starting the research we had to overcome the difficulty in locating users with the motor deficiency in their upper limbs who had no serious cognitive faults and could read and write. Therefore a single locale for the research was not enough and several sites had to be searched, including virtual communities.

Regarding the use of virtual communities (on-line ethnography), there are ethical issues related to the consent of data collection; the need to set boundaries to the research; avoiding the loss of focus whose maintenance is not trivial since this task depends on the bloggers' actions which is usually spontaneous. Another limitation of this strategy may be the truthfulness of facts and the bloggers' identity.

4. ETHNOGRAPHIC STUDIES

I. Study of face-to-face ethnography: The study was applied in an *Association of Parents and Friends of Handicapped Persons* (APAE in the Portuguese acronym) [APAE 2006], an organization whose objective is to help persons with special needs. Two users, both literate and wheel-chair users, who had some habit in web activities took part. Since user confidentiality was guaranteed, they will be called *user-1*, *user-2*, etc.

The web activities reported by APAE teachers or by the users refer to the use of e-mails, of social networks, MSN Messenger or chat environments. The users were observed as they attended IT lessons in the APAE's lab. Monitored by a student in the APAE institution, *User-1*'s shortcomings were to only be able to move two fingers of her left hand, speech impairments and problems in writing manually. Although her chronological and educational ages did not match, she could read and write. *User-2* was not considered a student, since she attended only the rehabilitation sections offered by the institution and her profile was quite similar to *User-1*'s, however she made effective use of her feet for typing and for chores considered manual (drawings made with the use of rulers and coins; cutting and sewing; use of musical instruments). She had speech problems and an aggravating factor related to visual deficiency.

Data collection was done with the reading of reports posted in blogs, virtual communities and websites by selected users, starting in February 2009 with the Internet implementation and the participation of *User-2* in the research, when both users showed interest in accessing e-mails, Orkut, blogs and search sites, in posting images (photos) and watching videos; of course sometimes they needed help in performing these tasks. *User-1*'s experience in Internet usage began in the APAE institution, while *User-2*'s already had web experience before joining same. Sub-section 5.2 (Result Analysis of Case Studies) describes more details. We can surmise that according to their reports, these users were not socially excluded, which proves that blog publishing systems can help in the social inclusion of such persons.

II. Study of online ethnography: One of the challenges posed during this stage was to locate persons who had the same profile at the two participants in face-to-face ethnography. The web was utilized for this task, as it broadened the search universe.

It was not easy to locate persons with the same profile of the users participating in face-to-face ethnography, reason enough to resort to another method of analysis. At this point we made a survey of the possibility and limitations of the application of on-line ethnography in the studies of blogs. These possibilities include: (a) exploration of communication through multimedia (text, audio and video), whereby these resources enrich traditional face-to-face ethnography; (b) ease in the search and collection of data; (c) scope in the collection and storage (both time and space); (d) quick application of the research.

We also consulted communities that handled cerebral palsy in a general way. Among several subjects identified in blogs, MySpace and websites, some dealt with assistive technologies or communications tools, or all these subjects at the same time. Even though the persons found were socially included, some felt the need to better fit in this environment and depended on other factors such as affordable assistive technologies.

Web-User-1 was a pedagogue, writer and public speaker. She was a 47-year old wheel chair user, using her tongue to type texts and a specially-adapted mouse and a virtual keyboard as shown in the published videos [Ferreira 2007]. *Web-User-2* was a 38-year old graphic artist at the time the interview to a blog called "Special Education Blog" was held, and was able to control the movement of his left forefinger [BLOG DE EDUCAÇÃO ESPECIAL 2006]. *Web-User-3* was an accessibility consultant for blogs, wheel chair user using her left thumb to type [Hyatt 2009]. *Web-User-4* was a 44-year old self-taught web designer using his feet to type [Correia Junior 1997].

Result analysis of the ethnographic studies: The data collected in the face-to-face ethnographic study, revealed that the computer helped in the improvement of *User-1*'s academic performance, since motor deficiency in the upper limbs can limit the development of hand writing. *User-2* needed systems allowing font resizing so that she would not have to resort so much to the use of a magnifying glass to read small letters, since she could not wear glasses due to lack of control in the use of her hands.

The lack of resources for resizing resulted in errors caused by the disposition of elements in the screen. In addition, we observed that web systems as well as blogs can encourage writing, since they don't require speed when typing. The cognitive process in the composition of the subject to be posted in the blog, helped *User-1* and *User-2* to improve their language. The reports collected in the second study (on-line ethnography) showed that the passion in typing text related to their histories and the publication of photos and videos are likewise a constant practice for the users in the research, according to their own depositions and according to the videos

they published in the web. Therefore, we could see that the blog empowers users and allows them to post texts, comments, images and videos. However one must analyze the blog publishing systems, to see if they are accessible to this audience. We also found out that the user may have trouble in adapting, but some users are able to use the tool even without assistive or adaptive technologies [Heidrich *et al.* 2003].

5. STUDY OF MULTIPLE CASES

Five users were selected for the study of multiple cases. This number was defined considering the recommendations of Jakob Nielsen who states that with any higher number, few relevant problems are detected by the additional users, whereby the problems start to repeat themselves [Nielsen 2000]. To adjust the tests and to avoid errors, in addition to the five users, two more persons were added to the evaluations (*pre-test user* and *test-user*). The *pre-test-user* had no motor deficiency and was a novice in blog publishing, so that her interaction would avoid some problems detected only with users with motor deficiency.

In order to set up the study of multiple cases, it was necessary to identify which web accessibility problems in blog publishing systems could jeopardize their utilization by users with cerebral palsy. This stage had an exploratory character, and for its execution, tests with automatic validators in publishing systems and on-line user questionnaire were deployed.

The tests with the Hera and DaSilva validators were applied on October 01 and 11 of 2009, re-applied and evaluated on October 25, 2009 in the home pages of the Blogger and WordPress.com publishing systems. These tests were applied before and during the pilot test's sub-stage. The online questionnaire was drafted and applied to the seven users before the test. It was intended to find out the length of their experience in the Internet, to detect personal limitations and to define subjects of interest to be published. The Google docs system - an editing tool for Google files - was utilized to draft the file since it offered tools to publish forms and sending the questionnaire to the participants' personal e-mails.

In the selection of participants, only the *pre-test-user* had no cerebral palsy, we opted for persons with cerebral palsy and motor deficiency in the upper limbs, who, due to this problem would need adaptations, as well as persons with serious cognitive impairment. It was important that they could read and write, had some knowledge in the use of the Internet and that they were interested in the access of and publishing in blogs. However, they should be novices in blog publishing. The users (1 and 2) analyzed in the first study (face-to-face ethnography) took part in the study of multiple cases as *user-test* and *user-1* respectively. Besides these users, four users were selected: 2, 3, 4 and 5, with all of them having the profile set up for the research. The persons analyzed in the second study (on-line ethnography) did not take part in the study of multiple cases. The participating users are described in Table 1.

Table 1. Characteristics of Users in the Case Studies

| Users | Diagnosis | Sex/ Age | Schooling | Length of Experience with the Computer |
|-----------------|---|-------------|------------------------------|---|
| <i>Pre-test</i> | No deficiency | F / 37 | Postgraduate in Education | Longer than 5 years. |
| <i>Test</i> | Spastic quadriplegic(speech impairment) | F / 27 | Literate | Longer than 1 and less than 5 years |
| <i>1</i> | Coreoatetoid Quadriplegic(speech and sight impairment) | F / 39 | Incomplete Primare School | Longer than 1 and less than 5 years |
| <i>2</i> | Atetoid Quadriplegic (speech impairment) | M /15 | Incomplete Primary | Longer than 1 and less than 5 years |
| <i>3</i> | Coreoatetoid Quadriplegic (speech impairment) | F / 15 | Incomplete Middle School | Longer than 5 years. |
| <i>4</i> | Spastic hemiplegic (light disfunctions on the body's right side) | M /34 | Incomplete High School | Longer than 5 years. |
| <i>5</i> | Spastic quadriplegic (sight impairment) | M /28 | Complete Middle School | Longer than 5 years. |

There are two types of systems for blog publishing: hosting software and blog publishing tools. Both are publishers, however in the latter, the user needs to find a dedicated hosting system and download this tool, thereby it is considered more complex as it requires more user expertise [Hyatt 2009]. The systems chosen for

were classified as software for blog hosting, offering hosting, i.e., the user does not need a dedicated hosting service [Gardner 2005]. The systems themselves allow publishing and already host the blogs. Therefore, the blog publishing systems selected were Blogger [Blogger 2009] and WordPress.com [WordPress 2009], as they are more user-friendly, not requiring web programming knowledge. However, other criteria were considered, such as popularity, gratuity, language, use of themes (templates or models), the feasibility of posting images and videos and an accessibility test performed by another research [Bez *et al.* 2009].

Observation with user participation: The observation with user participation had three stages: pilot pre-test, pilot test and test with users. During the pilot pre-test and the pilot test, we realized that it was better if the observations were done in a spot familiar to the users. We realized that it was possible to use a digital video camera recording on a memory card in .wmv format (for privacy reasons the images are confidential) and using the Webinaria (free) program to capture the screen and the users' actions in .flv format. We also used notes. With that, during the whole observation phase, we recorded the tests and the notes about the observations, both to be used at a later time.

The initial phases required the set up of tasks to be followed by users during the actual test performance with the purpose of confirming or not whether the automatic validators – Hera and DaSilva – detected the problems during the actual test performance in the same fashion, and to observe other problems not detected by the validators. This required the publication of blogs in the two blog publishing systems used in the research, so that we could set up a sequence of tasks for the publication tests. They were printed so they could be read by the users. Although the Blogger and WordPress.com publishers featured different interfaces and resources, it was possible to set common tasks to both, as recommended by the W3C for the evaluation of web accessibility [About-Zahra *et al.* 2006].

The following tasks were defined: typing the publisher's URL (whereby all URLs were supplied at execution time); setting up a login code and making an e-mail available to get access to the publisher; following the blog publisher assistant's steps; visualizing it after it is ready; editing the presentation text; altering the theme (template); posting texts, images and surveys; posting a page; visualizing the blog again; repeating the previous steps with the other publisher. These tasks were set up so that the final results consisted of two blogs, published and ready to be accessed at any time.

The pilot pre-test with expanded tasks was performed with the two publishing systems, WordPress.com on the 12th and Blogger on the 25th of October, 2009. We analyzed the feasibility of utilizing software and photo or video cameras to record the evaluation for analysis at a later time. The sub-section with the Result Analysis of Case Studies provides more details. Next, a pilot test was performed on November 2009 with the same objective of the pre-test; however it was more decisive, since it was performed with a user whose profile was similar to the other participants'. This helped to determinate the tasks' duration and helped to find out if the evaluation should be performed in the user's own environment or in a lab environment and if there was the need of assistive technology.

The proposal of the tests with users was to observe their behavior and to verify the difficulties detected through video recordings, screen capture and notes, evaluating the time expended to effect the publication tasks in the Blogger and WordPress, if possible on the same day, and if any task was not performed by the five, due to the lack of accessibility resources. The tests were performed during December 2009.

Analysis of results of the case studies: Table 2 shows the errors of priorities 1, 2 and 3 detected in the Blogger and WordPress.com initial pages.

Table 2. Number of errors detected in the Publishers by the Validators

| Level | Number of errors detected | | | |
|-----------------|---------------------------|---------|---------------|---------|
| | Blogger | | WordPress.com | |
| | Hera | DaSilva | Hera | DaSilva |
| Priority 1 | * | 01 (01) | 0 | 01 (13) |
| Priority 2 | * | 04 (04) | 04 | 02 (06) |
| Priority 3 | * | 02 (03) | 04 | 01 (02) |
| Total of errors | * | 07 (08) | 08 | 04 (21) |

The asterisk (*) represents the impossibility of evaluating by the Hera validator due to the occurrence of the following error: "https protocol not supported". In the results of the DaSilva validator, the errors are represented by the number of occurrences, while Hera determines the number of verification points. For this reason, the number of occurrences is shown in brackets. For example: Blogger is represented by DaSilva in the

following way: priority 1 – 01 (01), i.e. there is a verification point with error and this happened once during the evaluation. Priority 3 is represented as 02 (03), meaning that there are two different verification points with errors and in total there are three occurrences referring to the two points.

According to the results, we observed that WordPress.com did not show Priority 1 errors under the Hera validator. However in terms of the total number of errors, it found 4 (four) more errors than the DaSilva validator. To compensate, the Blogger publisher had the lowest number of error occurrences for the same verification point according to the DaSilva validator. Some of the errors found by automatic validators actually interfered in the access to these publishers by persons with motor deficiency, such as cerebral palsy victims. Table 3 highlights an error that is common to both automatic validators and users.

Table 3. Error 3.4. A – Agent; P – Publisher; Y – detected; N –not detected; NE – not evaluated

| Error | 3.4. Use relative units instead of absolute | | | | | | | | | |
|---------------|---|------|---------|------------------|---------------|------------|------------|------------|------------|------------|
| Level | Priority 2 | | | | | | | | | |
| Details | Absolute units in the CSS: absolute units were detected (in cm mm pt pc) or font sizes defined in px in the style sheet values. Problems with font sizes. | | | | | | | | | |
| P | A | Hera | DaSilva | Pre-test User | Test- user | User- 1 | User- 2 | User- 3 | User- 4 | User- 5 |
| Blogger | | NE | Y | N | N | Y | N | N | N | Y |
| WordPress.com | | Y | N | N | Y | Y | N | N | N | Y |

Among the problems found with automatic validators and with users, font resizing was the outstanding one, since when it was necessary to increase the font size with the browser, some page elements such as the scroll bar disappear or is shown in other spots, such as links. Also, empty spaces would appear, giving the impression of non-existence of text. This happened on WordPress.com with the *test-user*, *user-1* and *user-5*. With Blogger it happened to *user-1* and *user-5*. This indicates that most accessibility problems are related to vision problems since users 1 and 5 were diagnosed with visual deficiency without blindness. However this was enough to trigger a problem that can be even more harmful to people with motor deficiency.

Language errors were very common in WordPress.com, however this type of error did not bother people with cerebral palsy. We could see other problems which were not listed as web accessibility problems by the automatic validators, but were detected by users. They are: technical jargon (upload, screen name, gadget); difficult association of icons (image posting icons, videos); difficulty in identifying elements in the screen (links, buttons); problems with the tabulation sequence; need of orientation (activate blog through e-mail) and need to resort to another program to type the text (Microsoft Word). Problems that occurred in both systems and that were observed more frequently in WordPress.com confirm that it is considered a more accessible system, but not necessarily easier to use. All the users managed to complete the tasks and liked to participate, but in some occasions, asked the researcher to help in typing or in understanding what was requested of them.

6. RECOMENDATIONS FOR DEVELOPERS OF BLOG PUBLISHING SYSTEMS

The evaluations with the automatic validators were important to point out errors, but evaluations involving users were essential to check whether the errors identified by the validators actually harmed the users participating in the research. Even though accessibility is not only directed to blind persons, when one compares the results of automatic evaluations with tests performed by the users, one can see that web accessibility guidelines are still very much geared towards vision problems (some type of blindness).

Among the errors detected by the automatic validators, many were identified as problems interfering in the navigation through the keyboard and in the use of the screen reader type, which do not portray the condition of participating users since they navigate with the mouse and do not use such technologies.

An error that was detected by the automatic validators as well as by the users (*3.4 Use relative instead of absolute units in the values of the notation language attributes and in the values of style sheet properties*), brought about a series of problems such as: disappearance of elements and disorganization in pages. This affected persons with visual deficiency (not blindness), added to motor deficiency in the upper limbs and confirmed that most web accessibility problems are a result of visual deficiency. Table 4 presents a list of

recommendations for blog publishing directed to developers, which may contribute to guidelines on improvements for the access of users with motor deficiency in their upper limbs. The recommendations were classified according to the moment when problems were identified, ie, they were prepared based on the automatic validation and testes involving users. These practices cover items in conformity with accessibility guidelines, and sometimes are the same as usability guidelines. However the WCAG 1.0 guidelines use different priority levels, and depending on the level (priority 1, 2 or 3) those guidelines may be aligned with usability.

Table 4. List of Recommendations for Developers

| |
|--|
| 1 - Recommendations Based on Problems Detected by Automatic Validators as well as by Users |
| 1. "Use style sheets to control the disposition of elements in the page and the way they are presented". This practice prevents elements of suddenly changing their location, confounding the user. |
| 2. "Use relative instead of absolute values in the attributes of the notation language and in the values of style sheet properties". This prevents that problems in font resizing harm users who do not see well but are not blind, and in addition suffer from motor deficiencies. The non-utilization of this resource triggers other problems for people visualizing the page's graphic interface and causes problems with persons with motor deficiencies. |
| 3. "Use explicit associations between the labels and the form controls, for all controls with implicitly associated labels". This helps using the tab key for navigation, since the user may have problems positioning in a field due to the non-control in label association. Another problem may be the lack of sequence in tabbing. |
| 4. "Identify the document's main language and allow this language to be changed, for instance, from English to Portuguese or Spanish". This practice may help users who do not master a given language when publishing their blog. |
| 2 - Practices Based on Problems Identified Solely by User Evaluations |
| 1. Use clear language, easy for the user to understand, especially novices. IT terms should explain what they mean. |
| 2. Create icons which are clearly associated with their functions. For fast web page navigation, it is important to use images that are easy to understand for people with good vision as well as those who have some sight impairment. |
| 3. Provide better organization of window elements, i.e., dispose the objects so that the user does not have to search a distant link or button, or clicking on several elements until the desired function is found. This contributes to a better perception of elements. |
| 4. Need to instruct users. Systems have publishing assistants, but it does not always happen that the user is instructed how to fill out the fields. A novice user sometimes does not know that sometimes capital letters, blanks or special characters should not be typed. Sometimes these instructions are not displayed or displayed in a way that a more distracted user does not notice them. |
| 5. Detach user help instructions, or if they don't exist, add them to the system to prevent users from utilizing other software to satisfy a need, and as a result, taking longer to execute a simple task. Example: use of Microsoft Word (Text editor) as spell check or to resize the font. |
| 6. Avoid long registration procedures, such as blog activation by e-mail, or filling out Identity fields such as CPF (Individual Taxpayer Registration Number) or RG (Identity Card Number). The difficulty set up to provide more safety may make system access unfeasible. This happens mainly when the instructions to activate the blog by e-mail is not in the user's language (usually English). |
| 3 - General Practices |
| 1. Everything should be done to better instruct the user. It should be taken in account that the user may be a novice in web publishing, or unfamiliar with web jargon, who needs the system to help in his/her social inclusion. |
| 2. The system should be adapted to any kind of user, with visual, auditive, motor or multiple impairments. |
| 3. Users should be able to navigate the systems, according to individual habits, without having to adapt to a specific navigation mode. |
| 4. The tips of automatic validators could be clearer, contain more examples, helping developers in the search of information about web accessibility. |

7. CONCLUSIONS

The present study covered three research strategies: ethnographic studies in an institution (APAE), ethnographic studies in sites and blogs, and the study of multiple cases to establish a comparison among web publishing systems with the participation of users with cerebral palsy.

Based on these two ethnographic studies, we discovered characteristics, for instance, that they needed means for written communications and that they could interact with other users through blogs. Likewise, e-

mail, chat systems and social relationship sites were also considered for the study, but the blog system could encourage written communication, without requiring typing dexterity and having the same possibility of interaction as a relationship site. With that it was decided to research blog publishing systems and not to evaluate blogs already published by other persons, because the users had no experience in publishing and the activity of publishing their own texts could be more stimulating. In the Multiple Case Studies, two blog publishing systems were compared and evaluated in their accessibility aspects, in two modalities: one with automatic validators and the other utilizing seven users with no experience in blog publishing. Since users with motor deficiency have special needs, the multiple case allowed us to set up a list of recommendations on accessibility for developers of blog publishing systems (Table 4). In the future we intend to make a study to help users to follow up on their publications and to verify whether these blogs contribute to social inclusion.

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