

# Evaluation of Web Accessibility from the Perspective of Functional Illiteracy

## ABSTRACT

Functionally illiterate users, that means those lacking reading, writing, calculation and science skills, are potential Internet users, so technological solutions must ensure that content is intelligible to them. The interface design guided by accessibility norms and may improve accessibility, but considering accessibility evaluations is an essential part of this process. Evaluation can be automatic, performed by specialists or performed with the participation of users. Some barriers are only detected with user tests. Usually, usability tests are adapted and performed with the purpose of evaluating accessibility, but most of works in this area dealt with persons with visual impairment. This paper aimed to research the behavior of functionally illiterate users, identifying important characteristics that the evaluators and specialists should consider in the performance of an evaluation of accessibility with this audience. As a result was generated a list of important characteristics that contribute to the adaptation of usability evaluation methods with functionally illiterate users. Besides that, it was elaborated a list of best strategies that the specialists and researchers should consider in accessibility evaluation with the audience under examination.

## Keywords

Functional Illiteracy, Evaluation, Accessibility Recommendations

## INTRODUCTION

Information Systems have features that make them unique and different from other types of systems [4]. Interaction with each one of these systems is a particular process that requires a certain level of learning [10][17].

In order for a user to make use of the computational support provided by the systems, there should be no barriers preventing them from interacting with their interfaces [15][25]. Accessibility in the context of Information Systems is related to the removal of these barriers that prevent users from interacting with these systems through their interfaces [10][15].

The accessibility concept attributes equal importance to person with and without limitations in their capacity to

move, perceive, understand and learn. Therefore the idea of accessibility is related to the removal of the barriers that prevent more people from perceiving, understanding and learning [10][15][26]. Taking in account the accessibility norms and guidelines [18][29] in the design of interfaces minimizes the barriers of access to Information Systems [10]. However, in the later stages of interface design it is essential to work with users with different deficiencies or limitations to get a grasp on how they interact with these interfaces [10][26].

To verify this interaction, accessibility evaluations may be performed with the participation of users. However there are questions regarding the involvement of users in this type of evaluations, mainly those related to the method to be followed [3][16][28]. Some difficulties are tackled by researchers in the performance of accessibility evaluations, mainly in regard to the context of functional illiteracy, since the literature handles accessibility evaluations with the visually impaired in more depth [1][2][8][9].

This paper, of an exploratory character, aimed at studying the behavior and the human-computer relationship of the functionally illiterate to contribute in the drafting of recommendations to integrate them in an accessibility evaluation of Information Systems. These recommendations may be useful to help specialists and researchers in the performance of accessibility with the participation of functionally illiterate persons in order to make the textual contents and non-textual contents such as images, audio and video more accessible and accelerate the inclusion of the functionally illiterate in the information universe.

This paper was divided in the following manner: section 2 contains a survey on functional illiteracy; section 3 presents the main concepts about accessibility and accessibility evaluation with the participation of users; section 4 shows the research method used by the study; section 5 present the data obtained from an ethnographic study of the audience researched; section 6 presents the data obtained from an accessibility research with users who are not functionally illiterate, among them two associated to the education area; section 7 presents the results of an evaluation performed with functionally illiterate persons; section 8 lists the recommendations drafted for the conduction of accessibility evaluations with functionally illiterate persons, finally, section 9 presents the final considerations.

## FUNCTIONAL ILLITERACY

The United Nations Educational, Scientific and Cultural Organization (UNESCO) describes the functionally illiterate as persons who lack skills in the reading, writing, calculations and sciences, corresponding to the academic

education of having completed the three first years of basic school or the former primary grade, i.e., at least three years of complete academics [11][13][22]. Some Brazilian public institutions such as the Anísio Teixeira National Institute of Studies and Education Research (Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira - INEP) and the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística - IBGE) have adopted the functional illiteracy definition referenced by UNESCO [11][13][22]. Research undertaken by the IBGE in 2009 dealt with functional illiteracy indices, based on school grades. According to the IBGE, 21% of the Brazilian population is functionally illiterate [11].

The Paulo Montenegro Institute (Instituto Paulo Montenegro - IPM), an institution linked to the Brazilian Institute of Public Opinion and Statistics (Instituto Brasileiro de Opinião Pública e Estatística - IBOPE) and Educational Action (Ação Educativa), a non-profit institution, perform researches on surveys of two thousand persons from 15 to 64 years. They consist of tests of literacy and numeracy. Their results are the base of the Functional Literacy Indicator (INAF) showing the following grades of functional illiteracy [12]: illiterate; related to person unable to perform basic tasks involving the reading of words and sentences, even if they are able to read familiar numbers such as prices and telephone numbers; rudimentary literacy, related to persons able to read and understand information in short texts and, still, also to read and write usual numbers and perform simple arithmetic operations.

In the context of Information Systems on the web, it is important to consider the functionally illiterate as potential users and propose solutions accessible to them that are also adequate to a more literate public [17], ensuring that the content is easily understood [5][24].

#### **WEB ACCESSIBILITY**

Web Accessibility is characterized by the possibility of people being able to utilize the Internet and Information Systems, regardless of their physical-motor, perceptual, cultural and social capacities [2][15][17][21][26]. One of the forms of providing web accessibility is the performance of evaluations which can be: automatic, using accessibility validation programs; or human which rely on the participation of specialists and/or users with deficiencies or limitations [18].

Specialized literature [2][7][14][26][28] states that researches cannot analyze the accessibility of one site by only using automatic programs and with specialists, since the obtained results do not ensure that the content will really be accessible by all. Therefore, it is important to involve users in the evaluation of accessibility, since their participation makes the verification of how a system really works for the public possible [10][28].

#### **Accessibility Evaluation with User Participation**

In this evaluation, in addition to critical factors such as cost, time and user recruiting [3][28], the choice of method is paramount, since literature does not point to specific method to perform accessibility evaluations with the participation of users with some kind of deficiency or limitation [16]. However, it was found that propose the use of method of evaluation focusing on accessibility, relying on adapted protocols [9][10][28][29], without specifying however how this adaptation should be done.

Usability test is a type of usability evaluation method based on a process which uses a parcel of the audience to which the system is intended [4][20][23]. This method was mentioned in some works, since they were based in usability tests to evaluate the accessibility of web pages [1][2][8][9].

In continuation this paper will shows some activities related to the usability tests found in the literature [4][20][23] These activities were gathered and condensed in this research, in order to present most comprehensive reference.

##### *Test Planning*

This activity is essential to conduct test so that it is adequately conducted and that it may yield useful and trustworthy results [4], besides allowing the identification of the necessary costs for test execution [20].

The following tasks are performed in this activity: describing the test's purpose and objective; defining the participants' characteristics; describing the method to be followed; listing the necessary tasks for the test; describing the environment and equipments; making the evaluator's role clear; listing which data will be collected; describing how the results will be reported [4][20][23].

##### *Test Preparation*

Preparation is the activity that ensures that all elements necessary for the performance of the tests are organized [20]. The following tasks will be performed in this activity: defining the environment where the test will be done; finding and recruiting users; preparing a schedule for orientation; preparing the data collection instruments; drafting the questionnaires and the interviews; defining the task scenarios; executing the pilot test [4][20][23].

##### *Test Performance*

It is when the test is actually executed that the participant interacts with interfaces and is observed by the evaluator [20]. The following tasks take place in this activity: a presentation about how the test will be conducted; observation and recording of the proceedings; interviewing the participant after test ends [4][20][23].

##### *Information Analysis and Recording*

In this phase the checking and verification of the information collected in the executed evaluation takes place [20]. It also includes the tasks of gathering and consolidating this information [4][20][23].

### **Use of Usability Evaluation Methods to Evaluate Accessibility**

Some accessibility evaluation works based on usability evaluation methods with user participation were identified, most of them, people with disabilities, in order to evaluate the accessibility of web-enabled Information Systems:

(a) Qualitative and subjective technique for accessibility and usability evaluation proposed by Babu et al. [1]. This technique allows the characterization of the problems based on the participants' statements and on the audio output of screen reader programs used by visually impaired users.

(b) Recommendations for accessibility evaluations with the methods utilized by persons involved in web projects proposed by Bach [2]. This work evaluated the characteristics, the pros and cons of some accessibility evaluation methods. The author drafted a list of recommendations to evaluate the accessibility with visually impaired persons.

(c) Guide of the best practices in usability evaluation with the participation of visually impaired users proposed by Hagler et al. [8]. This guide recommends conducting other evaluations before the evaluation with users such as the heuristic evaluation of accessibility.

(d) Formal usability evaluation focusing on accessibility proposed by Henry [9]. This proposal describes the necessary steps for the performance of a usability test with the participation of users with disabilities in the development phase of a system project. The target public consists of the visually impaired.

### **RESEARCH METHOD**

This research, of an exploratory character, was based on the qualitative method of data collection and is made up of five states, described as follows:

1. Choice of method for the surveying of the information about the functionally illiterate: after the bibliographic survey, it was necessary to select the research method. Since information about the behavior of these users was not found in the literature, an ethnographic study was chosen because it allows the researcher to observe the research agent in his/her work or study environment [30].
2. Choice of the users' profile for the conduction of the ethnographic study: it was opted for functionally illiterate persons who are in a literacy process, i.e., youth and adults who were enrolled up to the fourth grade of basic education. To this end, the study was conducted in a learning institution for youth and adults.
3. Performing the ethnography: during this phase, the characteristics of the students' learning environment could be watched and recorded, and their behavior during the literacy and information technology lessons could be followed. In order to round off the ethnographic study, the informal conversations with the literacy and information technology teachers were recorded. After the ethnography

the data obtained in the informal conversations with the teachers and the observations recorded in the form of notes were analyzed.

4. Execution of the accessibility evaluation: in this phase four evaluations were performed with users who are not functionally illiterate, with the purpose of adjusting the evaluation to the functionally illiterate user. After this evaluation, it was performed two tests with functionally illiterate users.

5. Drafting of recommendation for the conduction of the accessibility evaluation with the functionally illiterate users: after the bibliographic survey and the analysis of the ethnographic study, recommendations for the use of usability methods to evaluate the accessibility with functionally illiterate users were drafted.

### **Limitations**

The resources necessary to determine whether a person with middle or high school is or is not functionally illiterate are not free. Thus, in order to perform the evaluation with the researched audience, the classification utilized by the IBGE and INEP was used, limited to persons older than 15 years with less than four years of study. However if another profile had used, different results would be showed.

The ethnographic study was limited to 45 days. If this period had been longer, new information could contribute to the drafting of recommendations.

### **RESULTS FROM ETHNOGRAPHIC STUDY**

Due to bureaucratic and time reasons the tests were not conducted in public schools. The research was shifted its focus to private schools. Only one consented that the research was conducted into your dependencies.

As others institutions [19], at this selected, curriculum also included information technology lessons, which underlines the importance of the development of interfaces accessible to the functionally illiterate, since they are increasingly involved in Internet activities. These classes contributed to the improvement of reading and writing through the writing and sending of e-mails, research in search sites among other activities.

After the ethnographic study, the observations were aggregated and analyzed in three approaches: literacy lessons, computer classes and informal conversations with the teachers.

### **Observations From Literacy Lessons**

In class, the students showed attention to the lessons and were interested in learning. Some difficulties perceived were related to the following approaches: (i) compound words or those that had to be joined to function as a noun, such as noun phrases; (ii) numeric values with digits above the tens; (iii) mathematical calculations mainly involving years; (iv) writing words with the "SS" digraph; (v) syllables and words beginning with letters G and J; (vi) sentences with many

phrases and words; (vii) unfamiliar words and those not in Portuguese; (viii) word separation; and (ix) punctuation.

The students copied everything the teacher wrote on the board. Sometimes, she requested that they pause copying the text and pay attention to what was explained orally. It was found that in cases of writing, they had a greater visual than hearing understanding, which may be attributed to the fact that they are more attentive to the text that was written on the blackboard. Whenever they could, some students asked the researcher if what they had written was correct. They were insecure in writing when they did not copy the text from somewhere and, in the presence of the researcher, some felt embarrassed when they made writing errors.

The reading was often done by the teacher with the students. This helped in understanding what was written. Beyond this shared reading, the teacher explained what she felt would be more complicated for the students to understand, using simple everyday words and orally articulating the words calmly and slowly.

It was observed that some students had difficulty in interpreting what was explained through examples, which could cause confusion or lack of understanding of the context of some subject. Therefore, reference to objects, nouns or situations to explain something should be done with caution.

The utilization of images and photos contributed to explain some subjects. The use of photos helped in writing compositions. Students were more likely to talk and write about day-to-day matters or of their own lives. Talking about holidays, personal life, family members and students' home town helped teaching history and geography, using their own life as introduction to these disciplines.

#### **Observations From Computer Classes**

Students' interaction with the computer was observed. In all classes the teacher would turn on the computers and prepare them to begin the lessons. The lessons covered spreadsheets, text editors and the Internet.

All students had e-mails that were created in one of the computer classes. E-mail activities helped the class schedule prepared by the computer teacher. The exchange of e-mails helped the improvement of reading and writing texts that included messages and slideshows sent by the literacy teacher.

The students browse the web looking for information and videos. In the Google site, activities to search for information made them happy when they found something about the theme by themselves. The ease of finding videos in the Youtube site impressed the students. In general, they were elated when they were able to complete their activities in the computer, but they would not let go of the teacher to execute their tasks. They would not hesitate in asking something to the teacher in completing their activities, especially those related to the reading and writing of texts in

the web. It was also noted that this group of users navigates slowly, since they look at and read everything that appears on the screen.

#### **Observations From the Informal Conversations with the Teachers**

In informal conversation with the literacy teacher, the researches were able to get information on the way to handle the students. According to her, writing was not part of their day-to-day. Adults who spent their whole life dealing with the spoken language, to read and write can be a great hardship. But talking to them about this hardship, in addition to respecting each individual's learning limit, is part of the literacy process.

Another observation highlighted by the teacher, is that for these students, an illiterate person is responsible for the failure of the country to develop, i.e., they blame themselves for Brazil's underdevelopment. Therefore, it was not advised to call them "functionally illiterate", even though this classification was not solely related to the academic profile, as utilized by UNESCO.

Besides that, even if a text is written in a more rudimentary level, this is not sufficient for students to understand the idea that is being conveyed. There are words and terms that leave them confused, leading to a sense of incapacity. Therefore, she recommended to always basing the lecture on shared reading explaining the written text.

It is advised to avoid using words that infantilize adult learners, such as "the mouse's little arrow". It is important to treat them in a way that does not put them in an inferior position in relation to more literate persons.

#### **RESULTS FROM EVALUATIONS WITH USERS**

Considering the information gathered in the ethnographic study and wishing to capture new data that could be generated in an evaluation with functionally illiterate users, it was performed evaluation with users who were not functionally illiterate:

(a) Controlled context (laboratory): Participant 1 - male with a college degree in finance, with over 5 years experience with the Internet. Occupation: Military; Participant 2 - female, master's degree in education, with more than 5 years experience with the Internet. The user has experience with youth and adults education. Occupation: Administrative Assistant.

(b) Context of Use: Participant 1 - male, with higher education degree in data processing over 5 years experience with the Internet. Occupation: Systems Analyst; Participant 2 - female with higher education with more than 5 years experience with the Internet. Experience with youth and adults education. Occupation: Secretary and Teacher of Information Technology for Adults in Literacy Classes.

The evaluation took place in the controlled context and in the user's use context, aiming to identify which

characteristics could influence in a real evaluation with a functionally illiterate person.

These were pilot evaluations to adjust future evaluations with real users. The work was done with two participants related to the teaching area and to the functional illiteracy context, since their experiences could give us relevant information to be used in the research. Such evaluations were based on a usability evaluation method. The method selected was the usability test, shown in subsection "Accessibility Evaluation with User Participation".

In order to perform the evaluations, it was necessary to select sites where the tasks would be executed. The ones chosen were public portals, that offered offering basic services (social security, labor rights, among others) to the citizen and which had the accessibility seal from some automatic validator. It was selected the sites of the Social Security Ministry (available at [www.previdencia.gov.br](http://www.previdencia.gov.br)) and of the Ministry for Labor and Employment (available at [www.mte.gov.br](http://www.mte.gov.br)). Both have the DaSilva's AAA accessibility level; and XHTML 1.0 and CSS, of the W3C.

Next, scenarios were created with two tasks for each site. They were created tasks near to the users' day-to-day:

(a) Ministry of Labor and Employment: You have a friend called Joe. He lives near to you. Joe is very happy. He got his first regular job. But in order to be hired he has to get his Social Security Card. Joe does not know the place or the necessary documents to get this card. Since you know how to navigate the Internet, you volunteered to get the information for Joe. So, you have two tasks to help your friend: 1) Find out the required documents to get the Social Security Card; 2) Find out the location of the nearest office where he can get the Social Security Card.

(b) Ministry of Social Security: You work in the administration of a cosmetics company. The work environment is very good and everybody is friendly. Many women work in this company. Five employees are pregnant. Your boss asked you to get information about maternity leave (bonus). He also asked you to give advice to these employees. Since you know how to navigate in the Internet, you are going to find information in a website. You need to find out the following: 1) Which documents are necessary to get the maternity leave (bonus)? ; 2) How long is the duration of the maternity leave (bonus)?

The complete texts of the questionnaire used to set up the profile, of the term of consent and of the task scenarios was verified and adapted by the Simplifica tool, an application used to draft simplified texts that can be understood by a greater number of readers [27]. After this adaptation, the texts were revised to substitute terms that could create doubts to the users.

### **Observations From Evaluations in the Controlled Context**

The evaluation performed in the controlled context was made in a closed, air-conditioned room with the following resources: desktop computer with access to the Internet, video recording software to record navigation, voice recorder to record user comments and the researcher's notes. Each evaluation took thirty minutes on average.

At the beginning of each evaluation, the user was asked to verbalize his/her opinions during the task's performance (think aloud protocol). During the whole time the users commented their opinions and were at ease during the test and in the interviews held before and after the test. This can be attributed to the fact that they were alone during the evaluation. There were no interruptions during the evaluation, which can be attributed to the request to turn the cell phones off and to the environment set for the evaluation.

The users' statements were important to perceive the tasks' difficulty level and which aspects could be improved in the evaluation.

According to User 1, "the tasks were quite interesting and pertained to the object, which is really to provide accessibility to those who have no contact with the Internet or have certain trouble and need basic information to integrate in society; therefore the tasks were really useful and usually those the general population demands".

According to suggestions by User 2, it is advisable to read the tasks and the documents with the user, pointing to the text which is being read, since "the person may be embarrassed to ask you to explain what is written, even because of not knowing the evaluator". Also, mentioned about unknown terms. He explained that "they (the functionally illiterate) will certainly not know what is accessibility, maybe they know what access means; therefore it is good to explain certain terms".

### **Observations From Evaluations in the Use Context**

The evaluation performed in the use context took place in the participants worksite supported by the following resources: user's desktop computer with Internet access, voice recorder to record the user comments and the researcher's notes. The navigation capture software could not be used, because it was not allowed to install software outside the users' work context.

Each evaluation took fifty minutes on average, from the beginning with the presentation of the evaluation objectives and acceptance of the term of consent, until its end with the task completion and the post-test interview. This increase of more than 50% compared to the evaluation in the controlled context can be related to interruptions such as picking up phone call, and those related to the user's own work environment, such as conversation with fellow workers. At the beginning of each evaluation, the user was asked to comment his/her opinions about the navigation during task

execution (think aloud protocol). However, both users did not comment much about their opinions. So, the research could only extract information about the evaluation after the task execution, when users were invited to voice their opinions about site navigation (debriefing). It was noted that in the consecutive verbalization technique, even though it is possible to extract relevant information, some important navigation points were not commented.

### **RESULTS FROM EVALUATION WITH FUNCTIONALLY ILLITERATES**

It was not to perform the evaluation with the public taking part in the ethnographic study, since the fact that they knew the researcher could influence the results. So, it was opted to look for participants through informal contacts with other researchers, friends and family members of the researchers.

After coming to the realization that an evaluation in the user's context could be influenced by other factors, it was opted to perform the evaluation in the controlled context. Some participants had difficulties in getting to the first lab set up, so it was realized that the utilization of a laboratory could be a limiting factor for the tests.

A portable laboratory was created to perform evaluations in a controlled context. It was acquired equipments such as notebooks and portable peripherals to conduct the tests.

Two evaluations were held individually with functionally illiterate persons. Both participants had incomplete primary education. The first one was a female with 2 to 5 years experience on the Internet and her occupation was homemaker. The second one was a male with more than 5 years experience with the internet and his occupation was welder.

#### **Observations Made During the Evaluation with the Functionally Illiterate**

The evaluation with the portable lab was made in an office of a residence, close to where the participants lived. The evaluation was supported by the following features: notebook with 3G Internet access, video recording software to record the navigation, voice recorder to record the user's comments and the researcher's notes. The evaluation took on average an hour and a half.

Before starting the tests, the researcher conducted an informal individual conversation with the participants. After that, users were encouraged to participate in the research.

The shared reading of the profile survey questionnaire and of the term of consent were done. Initially it was noted that User 1 had some trouble in reading and filling out the questionnaire. So, the researcher began filling out the questions. As the term of consent was read, the researcher explained unknown terms. The reading of the questionnaire as well as the shared reading, including the term of consent were recorded on audio.

At the beginning of the evaluation, the user was asked to make comments about the navigation during the task

execution (simultaneous verbalization technique). At the beginning of the test, the user strived to voice the comments, but it embarrassed the user when a difficult point was reached. So, the researcher was only able to extract information about the evaluation after the tasks were completed, utilizing the consecutive verbalization technique. Since the tasks on both portals were performed in succession, it was observed that the user naturally made comments comparing one site with the other, which was not the evaluation's objective. Besides, like in some previous evaluations, some important navigation points were not commented.

Another interesting fact is the time allotted to task execution. The user took more than ten minutes to complete each task, because trying to locate the requested information was not trivial. So, in order to make the user feel encouraged and continue participating in the test, the researcher asked if some help was desired, and upon getting a positive answer, would help the user to complete the tasks. After completing each task, it noted that the user was happy with the help, since she was able to complete the work.

### **RECOMMENDATIONS FOR ACCESSIBILITY EVALUATIONS WITH FUNCTIONALLY ILLITERATE PERSONS**

Based on the bibliographic survey, on the information obtained in ethnography and in the evaluations with functionally illiterate persons, some recommendations were drafted to help specialists and researchers in the conduction of evaluations of web accessibility with functionally illiterate persons.

#### **Mention to User**

Observations: Most functionally illiterate are part of the poorer class of society. Many live in rural communities areas and have had no opportunities to study.

Recommendations: Avoid referring to the users as "functionally illiterate" or even "handicapped persons". It is recommend calling them adults in process of literacy.

#### **Interpersonal relationship**

Observations: The evaluation of accessibility for these users may leave them shy. But while half shy, they feel at ease talking about personal life, the things they learned and the studies.

Recommendations: Before the evaluation, it is important to conduct an informal conversation about personal life and use of the Internet to make them a little more relaxed and less nervous about the assessment. This information can also be used as data for the analysis of results.

#### **Drafting and application of user profile determination questionnaires**

Observations: Although the functionally illiterate have some difficulties in reading and writing, they feel happy when they can perform activities related to these skills.

Recommendations: So that the users do not feel embarrassed about their difficulties in reading, it is recommended to assist them in completing the questionnaire, by shared reading. Images and photographs can also be used in the questionnaire in order to facilitate understanding certain questions.

#### **Drafting and signing the consent form**

Observations: The consent form is an important document related to confidentiality of data that must be read and signed by the participant [4][9][20]. However, this term can contain unknown words of the users' day-to-day.

Recommendations: In addition to having the term written in a simple and clear language, it is recommend its shared reading, explaining unknown terms and the document's context so that the participant can understand what he/she is signing. Another suggestion is that, in addition to the signature, the whole reading and the user agreement be recorded on audio.

#### **Time to perform the tests**

Observations: In an accessibility evaluation, the time expended for the completion of a task is not a determinant factor [10]. But in the course of this research, it was noticed that these users do not surf the web quickly, as they read everything that appears on the screen. It also became clear that since they are participating in a test, these users are not worried with time for completing the tasks.

Recommendations: In order to collect important information for the analysis, it is recommend the use simultaneous verbalization as a base. However, the user may not be able to verbalize certain points in navigation. In order not to make the evaluation tiresome, it is recommend to set a time for the execution of each task. This time can be managed by evaluator so that the whole test, from beginning to end, is not a wearing affair.

#### **Location and environment for implementation of the evaluation**

Observations: Generally part of this public lives in hard to reach locations or communities. Thus the site to perform the evaluation may be a determining factor to get volunteers for the research.

Recommendations: It is recommend setting up a portable lab to perform the evaluation. This means taking all the necessary equipment to place that all participants can easily reach.

#### **Preparation of the Task List**

Observations: The evaluation can be performed based on a list of tasks [23]. As the public has difficulty understanding with respect to the context of a subject, the tasks should be carefully planned so as not to influence the evaluation results.

Recommendations: To facilitate the comprehension of the tasks that are to be executed, it is important to plan them so

that they are close to the users' day-to-day, with relation to written text as well as Internet navigation.

#### **Assistance in completing tasks**

Observations: In conducting evaluations, the researcher's role is not to help the user quickly [23], but help him/her if needed [20][23]. And one of the features of this public is that they feel encouraged when they can finish a task.

Recommendations: It is recommend that after a time in which the user is trying to complete the task, the research assist the user in completing the task. Thus, the participant will be encouraged to continue in the evaluation. If this assistance is necessary, it is up to the researcher to consider or not the time spent after help was provided.

#### **Techniques to collect information about navigation**

Observations: In test with users who are not functionally illiterate, the simultaneous verbalization technique proved to be more efficient than the consecutive verbalization technique. However, it was noted that the functionally illiterate user does not comment much about navigation during the tests, preferring to voice his/her comments after them.

Recommendations: In order to collect important information for the analysis, it is advisable to use simultaneous verbalization as base. However the user may not verbalize certain point in the navigation. So, it is important for the evaluator to pay attention and to take notes about the user's navigation so that these notes can help in consecutive verbalization, if necessary.

#### **FINAL CONSIDERATIONS**

It is important to consider the functionally illiterate as potential Information Systems users and to propose accessible solutions that ensure that the textual content of these systems be accessible. The best form to ensure this is to integrate these users in the accessibility evaluation.

The literature did not yield studies that dealt with the participation of functionally illiterate persons in accessibility evaluations. So, this study adopted a qualitative technique of data collection aiming to obtain information and analyze the human-computer behavior of the functionally illiterate. The main objective was to analyze the characteristics of this public to generate input that would help their integration in the accessibility evaluations of a given system. In addition to this data collection, it was performed accessibility evaluations with users. The objective of this phase was to check if the collected information would help in the accessibility evaluation with a functionally illiterate person.

In the ethnographic study, it was observed that this public does not feel comfortable in being treated as functionally illiterate. The research showed that shared reading and the explanation of unknown terms is good strategy to make the context of what is being read understandable. With respect to the Internet, it was observed that the students use to read everything that appears on the screen and do not refuse help

to complete a task. About interpersonal relationship, they like to talk about their personal life.

In the accessibility evaluations with the users, the evaluation in the context of use suffers external influences which can affect the performance of the researched public, having in view that the navigation takes a little longer as they are used to read everything that appears on the screen. The utilization of the simultaneous verbalization technique was efficient in the capture of information. However, even if users are encouraged to continue commenting about navigation, they may get nervous, and not do the comments, forcing the evaluator to use the consecutive verbalization technique.

This paper concluded that researchers and specialists should be alert to certain approaches when performing accessibility evaluations with the functionally illiterate, since this public has unique characteristics that may influence their participation in the accessibility evaluation of web-enabled Information Systems.

Thus, a list of recommendations for the performance of an accessibility evaluation with the participation of functionally illiterate persons was drafted, having in view that the literature confirms the need to perform such evaluation with adapted protocols. Following the recommendations, it hopes to help developers, specialists and researchers in the performance of accessibility evaluations with the participation of functionally illiterate persons, in order to contribute to the development of easy to understand textual content and to make the accessibility guidelines more encompassing.

As a future study, it is suggested applying these recommendations in accessibility evaluations with functionally illiterate persons, checking the pros and cons of these recommendations and allowing their improvement.

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