

Accessibility levels of Portuguese Enterprise websites: Equal opportunities for all?

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Web accessibility is growing in importance as time goes by. Alongside this growth we find an increasing need for access to Web resources by those with some sort of disability. The Web is very important for spreading information and for promoting interaction between the various elements in society. Given this, it is essential that the Web presents itself as a totally accessible resource, so that it can help disabled citizens and their integration in society. This obligation should be even greater for enterprises as primarily the Web is used as a marketing and business platform.

With this document we present indicators regarding the [lack of] accessibility levels of Portuguese websites. This article is divided into eight parts containing theoretical and background considerations leading up to two different studies which the research team undertook. In the first study (considering WCAG 1.0) we make a comparison between the 1,000 largest Portuguese enterprises (annual sales volume) and the 1,000 best Portuguese SMEs¹ using a specialized software tool. In the second study a group of recommendations towards accessibility are made; these recommendations were achieved through a focus group interaction. We do also, however, present an insight into the WCAG 2.0 influence on existent accessibility levels.

Keywords: accessibility; evaluation; WCAG; W3C; Portugal; enterprises; recommendations.

1. Introduction

The introduction of new technologies and methods for the treatment and utilization of information makes our society more complete and able to evolve.

In the last two decades of the twentieth century, Information and Communication Technologies – ICT – have contributed in a significant way to a profound change in economic and social activities. These changes include increases in quality of life, as well as in the competitiveness and productivity of enterprises (Socrates, 2007).

¹ According to the recommendations of the European Commission, to be part of the Small and Medium Enterprises, one has to have under fifty employees, less than ten million Euros of business volume and less than ten million Euros of total balance (Liikanen, 2003).

Through the use of ICTs the mentally and physically disabled can be better integrated in society. However, for this to happen, it is necessary to increase efforts to adapt technologies so that they can be used by everyone, including those that have some sort of disability (Wenner, 2008).

The information society is a society for all. ICTs bring a clear and important influence to the various domains of daily life in society. Its applications cover the entire spectrum of social groups. Nevertheless, there are barriers to overcome, opportunities to explore and benefits to be taken advantage of. Therefore, it is not correct to create a brand new group of e-excluded people just by abandoning the unprotected. It is extremely important to promote universal access to e-literacy and e-competence (Gurstein, 2000).

The growing need for access to online information creates in turn the need for a guarantee of accessibility to this web content. According to the 2001 communication of the European Commission (EU, 2002a) there are 37 million disabled European citizens who need to be granted full access to web content.

This article is divided into eight parts, including the introduction and subsequent theoretical and background considerations (sections 1 through 4). Two different studies were undertaken by the research team. In the first study (section 5) we make a comparison between the 1,000 largest Portuguese enterprises (annual sales volume) and the 1,000 best Portuguese SMEs² using a specialized software tool (considering Web Content Accessibility Guidelines WCAG 1.0). In the second study (section 6) a group of recommendations towards accessibility are made; these recommendations were achieved through a focus group interaction. We do also,

² According to the recommendations of the European Commission, to be part of the Small and Medium Enterprises, one has to have under fifty employees, less than ten million Euros of business volume and less than ten million Euros of total balance (Liikanen, 2003).

however, present an insight into the WCAG2.0 influence on existent accessibility levels (section 7). Conclusions concerning our work are to be found in section 8.

2. The importance of accessible ICT

Given the fact that ICT helps to stimulate enterprise competitiveness and citizens' quality of life, the European Union should take advantage of all of the opportunities that these technologies have to offer (EU, 2005).

ICT currently has a very high penetration rate in the Portuguese enterprise market. The Agency for the Society of Knowledge confirms this statement in the analysis made of the inquiry conducted by the Portuguese National Institute of Statistics, according to which 95% of the enterprises with ten or more employees use computers; furthermore, 84% of them use e-mail and 83% have Internet access. For medium-sized enterprises (50 to 249 employees) these three indicators have the value of 99%. For big enterprises (250 or more employees) the three indicators all have a value of 100% (INE, 2007; UMIC, 2007).

Currently, in Portugal, there are about 400,000 employees in enterprises directly related to ICT. This value, according to the objectives of the Agency for the Society of Knowledge, will increase by about 3% in the near future (UMIC, 2007). Another value which, according to this same Agency, will also increase in the future is the number of people working with a computer in their workplace. This will increase from 19% (in the year 2004) to around 40% (in the year 2012) (UMIC, 2007).

Due to this, it is extremely important that ICTs become accessible to all, because if so, all those who work, or will work with them, can take advantage of the benefits that they bring (W3C, 2005).

The World Wide Web Consortium (W3C) is currently present in the World regulation of Web accessibility, and the 1.0 version of the guidelines for accessibility has just recently given way to the 2.0 version (which is thus the standard currently used for the creation of rules to encourage the creation of accessible Web content). Although the directives of the W3C are widely accepted as the standard to use, this same consortium is developing a second version of the guidelines for accessibility in order to define a new set of criteria and techniques, appropriately adjusted for the current technological level. According to the recommendations of the W3C, the 2.0 version of the directives for accessibility cover a larger number of recommendations for creating more accessible web content. Following these guidelines will make web content accessible to a larger number of people with disabilities, including blindness or low vision, deafness or hearing loss, learning disabilities, cognitive limitations, restrictions of movement, difficulties in speech, photosensitivity and combinations of these. Following this new set of directives, the final result will be web content more accessible to all users (W3C, 2008a).

3. Web accessibility

According to W3C “Web accessibility means that people with disabilities can use the Web. More specifically, Web accessibility means that people with disabilities can perceive, understand, navigate, and interact with the Web, and that they can contribute to the Web. Web accessibility also benefits others, including older people with changing abilities due to aging.” ISO (Kern, 2008), in turn, defines accessibility as the

“usability of a product, service, environment or facility by people with the widest range of capabilities”, where usability is the “extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use”.

In fact, the issue of accessibility has two main components (Chisholm and Henry, 2005), the technical components (related to the tools and the content that we are working with), and the human component, involving content producers, end-users and tool developers. This means that, "to realise the dreams of people with disabilities", tools have to enable the creation and modification of the content in web pages which must be made accessible. Accessibility has therefore to be looked upon from the two perspectives and, to this end, the Web Accessibility Initiative (WAI) of the World Wide Web Consortium (W3C) was launched as an organized effort to tackle this issue. In this context we would highlight the following guidelines:

- Authoring Tool Accessibility Guidelines (ATAG)
- User Agent Accessibility Guidelines (UAAG)
- Web Content Accessibility Guidelines (WCAG)

Whereas the ATAG define how authoring tools should help Web developers produce Web content that is accessible and conforms to WCAG, UAAG outlines how to make user agents accessible to people with disabilities in order to raise the level of accessibility of Web content. In this context, this paper's focus is the human component and, namely, the end-user perspective of the consumer interacting with existing Web content and applications and, therefore, in the Web Content Accessibility Guidelines (WCAG 1.0).

3.1 General overview

The Oxford English Dictionary states that accessibility is a derivative of the adjective accessible which means “able to be accessed” or “friendly and easy to talk to; approachable” (Oxford, 2010). The Webster’s Online Dictionary defines accessibility as “the attribute of being easy to meet or deal with” (Webster’s, 2010). The International Organization for Standardization - ISO - which is “probably the most well-known and highest profile standards making organization in the world” (Fourney and Carter, p.1) published in 2002 the ISO TS 16071 which was the first major international software accessibility standard, “a collection of empirically derived guidelines” (Carter and Fourney, 2004, p.17). The focus of accessibility therein (please refer to the ISO accessibility definition above) is not on the user but on a computing agent’s usability, this usability thus representing the problem which needs to be solved. Our article is concerned with the concept of accessibility, the definition of accessibility above by ISO (2002) having been maintained by a recent ISO publication and as concerns interactive systems (see ISO 9241-171, 2008, p.2). Increased accessibility is seen to be a desired path to promote “increased effectiveness, efficiency and satisfaction for people having a wide variety of capabilities and preferences” and, furthermore, “the accessibility planned for a product can be defined, documented and verified (e.g. as part of a quality plan)” (ISO 9241-171, 2008, p.8).

As concerns computing, a specialty definition of accessibility is “the extent to which software facilitates selective use or maintenance of its components” (Webster’s, 2010). In computing a correctly developed website “often includes high contrast fonts, modified keyboard actions, larger fonts, text-to-speech programs, alternative input device support”, among others (Webster’s, 2010). Specific examples

include having textual equivalents for images, thus enabling blind users with text-to-speech software or text-to-Braille hardware to access desired information; furthermore, large/ enlargeable text and images make access to users with poor vision easier; and clickable links which are large in size make it easier for all to access content especially those who cannot exert precise control over a mouse.

Indeed the aforementioned ISO 9241-171, on the “Ergonomics of human-system interaction – Guidance on software accessibility”, provides guidance “on the design of the software of interactive systems so that those systems achieve as high a level of accessibility as possible” (ISO 9241-171, 2008, p.vi). Table 1 lists major principles for designing accessible software.

Principles	Description
Equitable and error-tolerant use	“Provide the same [identical or equivalent] means of use for all users” (ISO 9241-171, 2008, p.8) while at the same time being error-tolerant (ISO 9241-110, universal design principles/design for all DFA).
Suitability for the widest range of use	Solutions should be designed so that they “will be useful, acceptable and available to the widest range of users within the intended user population, taking account of their special abilities, variations in their capabilities, the diversity of their tasks, and their differing environmental, economic and social circumstances” (ISO 9241-171, 2008, p.9).
Flexibility (ISO 9241-110, DFA) and Robustness (WCAG 2.0 Principle No. 4) (WAI, 2005)	“Software should be flexible in use, enabling users to choose from a wider range of input and output alternatives... [and] should be designed to be as <i>robust</i> as possible to allow it to work with current and future assistive technologies [as the need to use add-on assistive technologies – hardware or software, such as a Braille display or a screen reader, which is added to a system or incorporated within it to satisfy the need of an individual to increase his or her accessibility (ISO 9241-171, 2008) – is at times inevitable]... The software can promote integration of assistive technologies by providing information that can be read by assistive technologies, and by communicating through standard application-to-application communication protocols” (ISO 9241-171, 2008, p.9).

Table 1. Major principles for designing accessible software

The Web is revolutionizing the access to information and the opportunity to actively participate in society by people who have disabilities (Thatcher *et al.*, 2006). If website accessibility levels are high (enabling the perception and understanding, and the navigation and interaction with websites) then all sectors of society including groups such as children, seniors and people with disabilities can be more independent and lead more fulfilling lives (Thatcher *et al.*, 2006).

According to Nielsen (2002) accessibility and usability are very closely related, as indeed the ISO definition included above contests also. “Usability is associated not with the product in itself, but with the interaction between the user and the product. The emphasis on the quality of the interaction is regarded as also being fundamental to the goal of increasing the levels of accessibility achieved in software products” (ISO 9241-171, 2008, p.83). Increased accessibility for users with a disability of some degree inevitably leads to improved usability for all segments of society. Attention to simplicity, ease of use and to ease of (dynamic) learning in the design stage of websites is essential and will minimize user errors (Nielsen, 2002).

So, the term accessibility can easily be defined as the possibility for disabled people to interact with a product, resource, service or activity in an equal way, just as someone without any disability would do. Concerning ICT, we can define accessibility as the creation of interfaces that are perceived, operable and easy to understand by those with a wide range of disabilities. This includes all disabilities, such as visual impairment, hearing problems, and physical, cognitive or neurological limitations. Beyond this, accessibility features also make all products more available to those who do not have any kind of disability (W3C, 2008a).

According to Shawn Henry and Jim Thatcher, the web accessibility goal is to provide all disabled citizens with the ability to perceive, understand, navigate and interact with the web, regardless of their disability (Thatcher *et al.*, 2006).

A website's accessibility level is largely based on four factors: the information presented by the website, including text, images, forms, sounds, etc. (web content); web browsers, media players, etc. (User Agents); the user's knowledge, experiences and in some cases, adaptive strategies; and screen readers, alternative keyboards, and scanning software (Assistive Technologies).

Although the combination of these four factors determines the accessibility level presented by a website, we also need to understand which of these factors can be better controlled and easily improved.

According to W3C, the accessibility of web content is largely determined by the developer's accessibility knowledge, skill and effort, by the authoring tools support for creating accessible content, and by the evaluation tools that will allow a validation of the accessibility levels presented by the created web content (Brewer, 2006).

In many countries the law mandates web accessibility and consequently policies exist to that end, for example in the USA, the European Union, and Australia and Canada (Slatin and Rush, 2002). Despite these policies studies have found however that websites, when used by people with disabilities, can be "three times harder to use" as compared to the use by people without disabilities (Nielsen, 2002, p.xx). Our article in particular focuses upon corporate website accessibility levels and we seek to emphasize how there is a flagrant disregard for people with disabilities in some countries, even within the European Union. The case we focus upon is that of

Portugal and of the 1,000 largest Portuguese enterprise websites as well as the 1,000 best Portuguese SME websites.

4. Regulations and the World perspective

The first time web accessibility became a matter of concern in the European Union was in September 2001 through a communication made by the European Commission to the European Council, to the European Parliament, to the Social and Economical Committee and to the Regions Committee. This communication was a result of the wide scope of the “eEurope 2002” action-plan which was approved in the Feira’s European Council (EU, 2002b). After 2001, and as web accessibility importance was growing, the European Commission launched the “eEurope 2005” action-plan. This plan’s goal was the creation of modern public websites and the creation of a dynamic environment for e-business through an enormous offering of broadband access with competitive prices and through a secure infrastructure for information (EU, 2003).

Web content accessibility has been a priority for various world entities, such as the W3C consortium which in 1999 created the World Accessibility Initiative – WAI. This initiative was created with the aim of being a parallel organization to the W3C and its mission was to develop guidelines that would be understood as the international standards for web accessibility; as well as to develop support materials for a better understanding and development of web accessibility, and to develop new resources through international cooperation (W3C, 2008b).

Since the year 1999 WAI has been aiming for an increase of web content accessibility by creating several tools that facilitate this. An example of those tools is the Web Content Accessibility Guidelines. These guidelines are an explicative

document of how to create web content so that it can be accessed by anyone, including those who have some sort of disability. According to the first version of these same guidelines, web content is all the information within a web page or web application. The accessibility guidelines were characterized by three main aspects, the guideline checkpoints, the priority levels (level 1, level 2 and level 3) and the conformance levels (level A, level AA and level AAA) (W3C, 1999). The priority level 1 checkpoints are those that, according to the W3C, must be implemented so that a website can be accessible to the majority of users. Priority level 2 checkpoints are those that should be implemented because they bring a great improvement to the overall accessibility and usability of a given website. The priority level 3 checkpoints are those that may be implemented so that the entire website can be accessible by all users (W3C, 1999). The conformance levels could be characterized as the “level of accessibility” presented by a website. If a website implemented all priority level 1 accessibility checkpoints, then it would have the conformance level A. If a given website presented all the priority level 1 and priority level 2 accessibility checkpoints covered, then it would have the conformance level AA. By implementing all the priority level 1, 2 and 3 accessibility checkpoints a website would have the conformance level AAA (W3C, 1999). Fortunately WAI has worked on this first version and created a new version of the Web Content Accessibility Guidelines. This new version, named “Web Content Accessibility Guidelines 2.0 – WCAG2.0”, presents some differences from its predecessor. According to WAI, WCAG2.0 covers a wide range of recommendations for making Web content more accessible and following these guidelines will make content accessible to a wider range of people. Following these guidelines will also often make your Web content more usable to users in general (W3C, 2008a).

The Web Accessibility principals have also changed in the 2.0 version of the W3C guidelines. In this new version, there are four principals that web content must have (W3C, 2008a):

- Be Perceivable – Information and user interface components must be presentable to users in ways that they can perceive;
- Be Operable – User interface components and navigation must be operable. This means that users must be able to operate the interface (the interface cannot require interaction that a user cannot perform);
- Be Understandable – Information and the operation of user interfaces must be understandable. This means that users must be able to understand the information as well as the operation of the user interface;
- Be Robust – Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

Each of the guidelines that compose the new and updated version of the W3C WCAG2.0 is divided into success criteria. These are the indicators that the Web content developers must follow to ensure their content is accessible to all users. These criteria are very similar to the WCAG1.0 checkpoints, and they also are divided according to their “importance” to Web content accessibility (Level A – success criteria that must be implemented; Level AA – success criteria that should be implemented; Level AAA – success criteria that could be implemented) (W3C, 2008a).

Web Content Accessibility Guidelines 2.0 was created with a new conformance level definition in mind. In this new version, there are three conformance levels (W3C, 2008a):

- Conformance Level A – All level A Success Criteria are assured;
- Conformance Level AA – All level A and B Success Criteria are assured;
- Conformance Level AAA – All level A, B and C Success Criteria are assured.

According to the World Health Organization - WHO, 10% of the World's population suffers from some form of disability. This number clearly shows the existing need for health and rehabilitation services. As a way to disseminate and create awareness of this reality, the WHO created an action plan called "Disability and Rehabilitation Action-Plan 2006-2010" (WHO, 2006).

In 2001, a demographic study named "Censos 2002 – População residente com deficiência segundo o grau de incapacidade e sexo" was performed by the Portuguese National Institute of Statistics – INE. According to the results of the study, there were 634,000 Portuguese citizens with some kind of disability (INE, 2002).

Worldwide awareness of the Web content accessibility issue is growing every day. This same awareness is evolving globally to enterprise markets because disabled people are using ICT on a more regular basis, and their economic influence is also growing. As a consequence of these global "movements", the Portuguese enterprise market should also adapt to this new reality.

In Portugal there is a serious lack of accessibility reports (UMIC, 2005a; Vector21, 2007). During the research process that led to this study, only five reports

on Web accessibility were found; four that were directed at Portuguese public administration Websites and a fifth that was presented by Vector21 (Vector21, 2007), where it is possible to view the results of an accessibility evaluation of sixteen Portuguese enterprise Websites. As a result of this terribly low number of existing reports, it is possible to acknowledge a serious lack of accessibility reports that bring simple and clear indicators on the accessibility levels presented by Portuguese enterprise websites.

5. Web accessibility evaluation using a specialized software tool

As we have seen above, “Web accessibility is the practice of making websites accessible to all, particularly those with disabilities” (Bradbard and Peters, 2010, p.1) However, “many websites are designed with visual aesthetics, rather than equal access, as the goal” (Bradbard and Peters, 2010, p.2). Web Accessibility Evaluation Proceedings - According to the W3C Web Accessibility Initiative, the accessibility evaluation of a website is a process achieved by the following steps: definition of the scope of the evaluation, definition of the evaluation tools, definition of the proceedings for the manual evaluation and definition of which reports will result from the evaluation process (W3C, 2006).

For the definition of the scope of the evaluation, we had to identify the criteria to be used for the accessibility evaluation and who would be part of the target group. In order to achieve good results, we decided to use the “AAA” accessibility level announced by the W3C as the evaluation criteria (W3C, 2008c).

For the evaluation tool, we chose the TAW3 tool (CTIC, 2008). This was the web accessibility evaluation tool we chose because it is executed according to the following points:

- The evaluation is based on the W3C Web Content Accessibility Guidelines 1.0 (WCAG1.0 was replaced by WCAG 2.0 in December 2008. However, due to the newness of WCAG 2.0 many authoring tools as well as evaluation tools and legal mandates “are still geared to WCAG 1.0” (Bradbard and Peters, 2010, p.14));
- It is free to use by anyone;
- It automatically analyses all the pages of a website;
- It creates a report with all the accessibility failures encountered in a website;
- It is available in several languages, including Portuguese and English.

For this project we decided that the manual evaluation of the websites of the entire target group was something that we wouldn't be able to achieve in the period of time that we had for the resolution of this project. As a result of this situation we decided not to manually evaluate the referred websites (for example, a WCAG 1.0 guideline such as “Provide equivalent alternatives to auditory and visual content” has five checkpoints; another WCAG 1.0 guideline “Ensure that text and graphics are understandable when viewed without colour” has two checkpoints, still further, the WCAG 1.0 guideline “Provide clear navigation mechanisms” has ten checkpoints; a total of 14 guidelines are present in WCAG 1.0 to make possible the design and evaluation of accessible Internet websites; this in turn leads to a total of sixty-five checkpoints (Bradbard and Peters, 2010) meaning that a manual evaluation of a significant number of websites, as is the case of our study, was too cumbersome given our project timeline).

Concerning the kind of reports that would result from the evaluation process we decided to do a group of simple statistical studies (average, standard deviation,

maximum and minimum) that would represent the reality of the Web accessibility level presented by the Portuguese enterprises.

5.1 Target evaluation group

For the definition of the target group we realized that evaluating all the Portuguese enterprise Websites was extremely complicated, so as a way to solve this issue we decided to evaluate the 1,000 largest Portuguese enterprises during the year of 2005 (INE, 2007), and the 1,000 best Portuguese SMEs during the same year (Exame, 2007).

Another reason for the choice of this target group was the fact that it contained enough important and representative enterprises for the acknowledgement of indicators on the accessibility levels of the entirety of Portuguese enterprise Websites.

Even though this was our initial target group, after researching the Websites of the 1,000 largest Portuguese companies, we reached the conclusion that only 777 of these companies have online Websites, and 223 of this same group don't have a Website or have one that is "under construction" or even have one that is incompatible with the evaluation tool we've chosen. Research on the Websites of the 1,000 best SMEs led us to conclude that only 649 of the initial 1,000 were online. From those 649, only 642 could be evaluated with the chosen evaluation tool.

For these reasons the "final" target group was only composed by 777 of the 1,000 largest Portuguese enterprises and by 642 of the 1,000 best Portuguese SMEs.

We believe that comparing the Websites of these Portuguese enterprises is a good choice because ICT have a direct impact on citizens' quality of life, and because the enterprises are, as each day goes by, increasing the amount of online services that should be available for all, including those with some form of disability.

5.2 Evaluation results

The evaluation starting point was the target group analysis. With this initial analysis we aimed to check the number of the 1,000 largest Portuguese enterprises that had an available Website and to check the amount of the 1,000 best Portuguese SMEs that had an available Website. This test was made by searching in the several search engines available (Google, Yahoo) and also in the Portuguese yellow pages via all of the enterprise Websites, and if any was found then it was accessed with the Microsoft Internet Explorer browser.

The results of this analysis concluded that 82.8% of the initial 1,000 largest enterprises had an available Website and that 65% of the best 1,000 SMEs had an available website. These early results can be seen in figures 1 and 2.

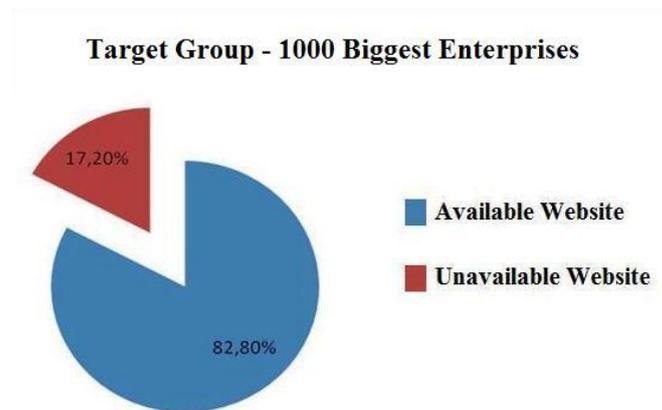


Figure 1. Relationship between the largest 1,000 Portuguese enterprises with an available website and those without an available website

Target Group - 1000 Best SMEs

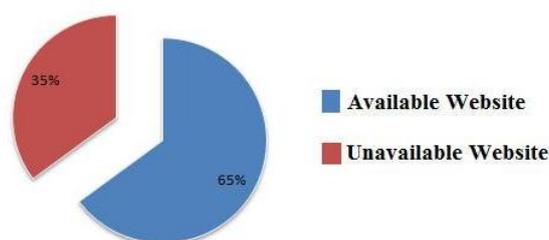


Figure 2. Relationship between the best 1,000 Portuguese SMEs with an available website and those without an available website

After this initial process, the available Websites were tested against the W3C/WAI accessibility guidelines with the help of the TAW3 tool. This test was made manually by introducing each enterprise website in the TAW3 tool and also by manually treating the returned results in a way that they could be analyzed and statistically treated.

The first element that was retrieved from this evaluation was the fact that 6% of the initial 82.8% largest Portuguese enterprise Websites couldn't be evaluated. The same happened with 1% of the initial 65% best Portuguese SMEs. This occurred due to incompatibilities of the referred Websites and the chosen evaluation tool.

Although the goal of this evaluation was to achieve indicators of the accessibility levels presented by the largest 1,000 Portuguese enterprise Websites, and by the best 1,000 Portuguese SME Websites, it is essential that the results that support those indicators are correct and reliable. In order to achieve this, a statistical analysis had to be performed of the evaluation results. The initial treatment/ analysis consisted of applying the outlier definition to the referred results (Mendenhall and Sincich, 2007). Figure 3 presents a schema of what was applied to the results in this statistical treatment stage.

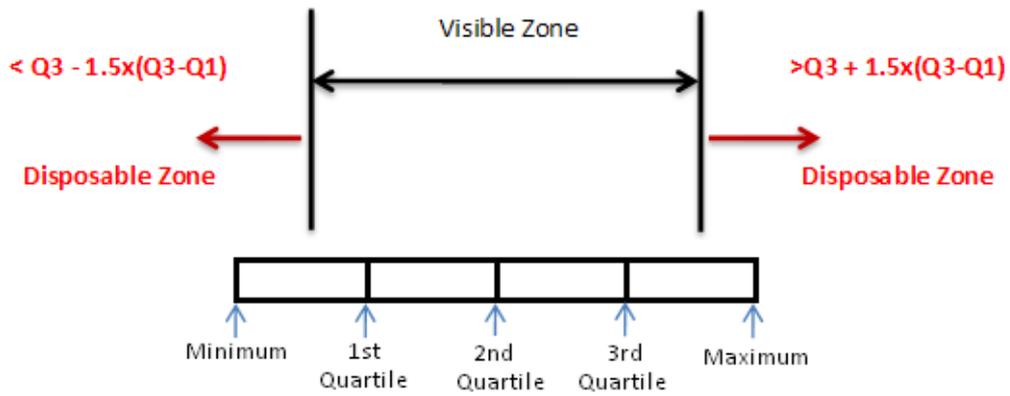


Figure 3. Outlier's treatment schema

After this treatment had been performed on the results, we achieved a new sample of results that can be seen in figure 4.

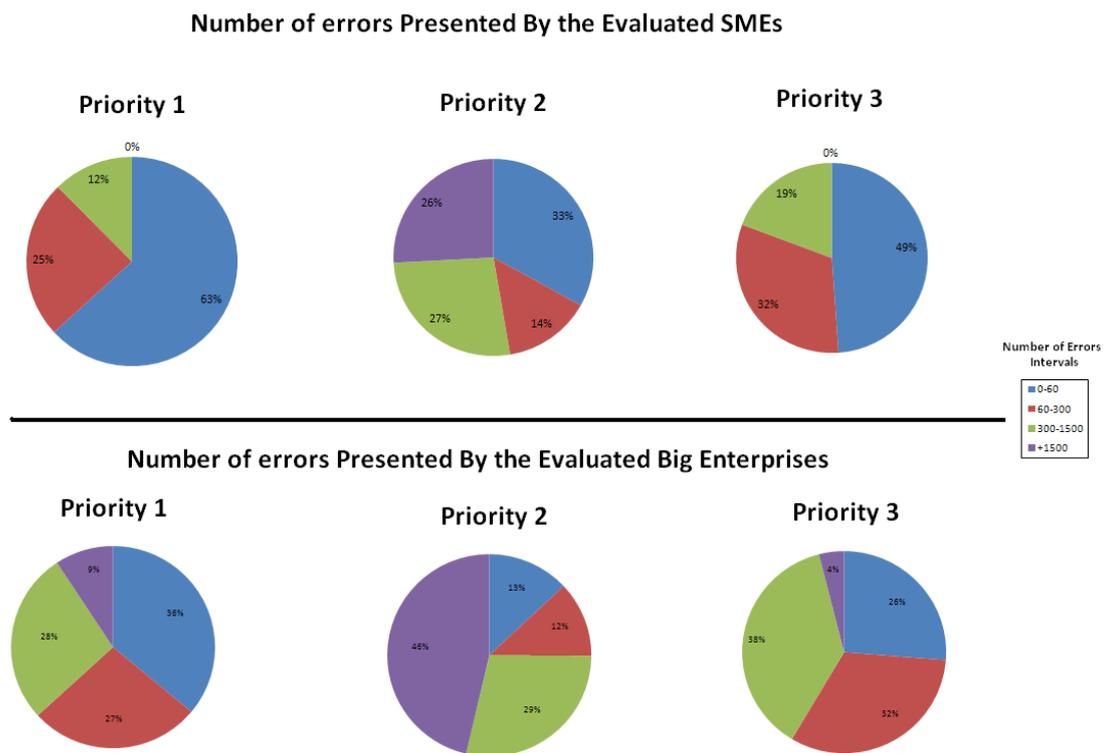


Figure 4. Comparison between the number of errors presented by the websites of the evaluated enterprises

As we can see in figure 4, the number of accessibility errors that were detected is extremely high. These results indicate that the Priority 1 errors (that according to the W3C shouldn't exist in a website), are indeed present in the Portuguese enterprises' websites. Another aspect that can be perceived from figure 4 is the fact that more than seventy percent of the biggest Portuguese enterprises' websites have more than 300 Priority 2 errors. Also in figure 4 it's possible to see that the number of websites with a number of Priority 1 errors between 300 and 1500 is much bigger in the largest Portuguese enterprises. Alongside this, the number of websites with a number of errors that fitted the interval between 0 and 60 is relatively larger in the SMEs than in the largest enterprises.

Although the number of Priority 2 errors is more dispersed, we can perceive that the number of websites with more than 1,500 of these errors is, by far, bigger in the largest Portuguese enterprises' websites. Another aspect that's also visible is that almost half of the SME websites evaluated have less than 60 priority 3 errors. On the other hand, almost 40% of the websites belonging to the largest Portuguese enterprises have a number of errors between 300 and 1500.

5.3 Examples of detected errors

During the accessibility evaluation associated with the present project, a huge variety of errors was found. As an example of this variety we show below some examples of these failures.

- I. Lack of equivalent alternatives to auditory and visual content:
 - a. The Web content creator should provide a text equivalent to every non-text element (e.g., via "alt", "longdesc", or in element content);

- b. Redundant text links should also exist for each active region of a server-side image map.
- II. Incorrect use of markup and style sheets:
- a. Style sheets should be used to control the Web content layout and presentation. These style sheets should also be compliant with the W3C regulations; the use of the “absolute” unit instead of a “relative” unit is clearly a flaw according to the W3C. This Consortium states that the Web content creator should use relative rather than absolute units in markup language attribute values and style sheet property values.

6. Data collection and analysis via a focus group

This section presents the procedures and tools used to gather, organize and analyze data. Many qualitative researchers prefer the term "empirical material" to the word "data" since most qualitative data is non-numeric (Myers, 1997).

Focus groups are interactive discussion groups used to generate knowledge and hypotheses, as well as to explore opinions, attitudes and attributes (Fern, 1982). For McDonald (McDonald, 1992, 1994) a focus group is seen as “...[a group] discussion of a particular topic under the direction of a moderator who promotes group participation and interaction and manages the discussion through a series of topics” (McDonald, 1994).

Focus groups seek to maximize search time and to take advantage of the synergies that arise from group effort (Parent, 2000).

Stewart and Shamdasani (1990) point to the advantages of focus groups over other methods such as individual interviews and Delphi groups from the point of view

of the researchers and participants. To participants, focus groups offer synergy, momentum, stimulus, security and spontaneity. To researchers they offer collective wisdom, innovative ideas, structure, speed and specialization.

The focus group required preparing a list of subjects to cover. This list of subjects evolved into a sequence of questions and sentences for comment. This tool was reviewed and tuned in order to reach the defined goals.

A letter requesting the participation and explaining the goals, the focus group process, and the use of data gathered was sent to the interviewees.

The focus group was realized in the physical presence of the participants, had the duration of about two hours, and was tape-recorded (with explicit concordance of the participants). The Curriculum Vitae of the participants were also requested.

The focus group recording was transcribed verbatim and the resulting document was sent to participants for revision and acceptance. Confidentiality was assured at all times.

Before analysis of content, verbatim documents and notes were organized. This material was processed through content analysis based on emergent thematic categories. Data analysis, in qualitative research, is a phase of the research process that occurs every time the researcher collects new data. During the analysis the researcher must continually use what has already emerged (Deslauriers, 1991). One of the key elements in qualitative data analysis is the systematic coding of text (Strauss and Corbin, 1990; Miles and Huberman, 1994). Codes are the building blocks for model building and the foundation on which the analyst's arguments rest. Codes embody the assumptions underlying the analysis.

The first coding step consisted of organizing all the contents into major topics. As they had been identified, these new topics were also considered in the organization

of the information. The second step was to iteratively look for similarities, differences, common denominators, models and other relevant aspects. Through this process, the different categories began to emerge.

Several memos and diagrams were built alongside this procedure with the analysis based either on the verbatim descriptions or on the notes registered during the focus group. Memos and diagrams help put on paper the preliminary products of the iterative analysis (Fortin, 1999).

6.1 Discussion of the focus group findings and recommendations

Here we intend to systematize several issues that probably are behind the results presented in this paper. The following numbers are a result of the systematic analysis made by the Focus Group of e-Business, as well as of several interactions of this group with the private and academic sectors.

The recommendations made by this focus group aim to contribute to the improvement of the present situation.

6.1.1 Focus group considerations:

- The strategic vision of company managers, present on the Web, doesn't include in most cases a strong and credible commitment with the adequate financial investment in order to achieve success;
- The general knowledge about accessibility issues is very low, including in the companies that are suppliers of Web services;

- Several solutions are implemented by companies or consultants, based on typified websites, cheap, but with low ergonomics and accessibility;
- Software applications in general, and websites in particular, are oftentimes built by experts, for other experts, resulting in difficult access for people with low technology or Internet knowledge;
- There's a lack of legislation in Portugal to consider all of the Portuguese websites. Thus, only the public administration websites and of public services are under legal appliance. We demand for a global structured legislation applicable to all private and public sectors, aligned with the best international practices.
- Worldwide there are several accessibility tools; however, they are not used in Portugal in a consistent way in the development phase of Web applications or after a go-live. We consider this to happen because of a lack of knowledge about the existence of these tools and the way that they work. Furthermore, companies are probably wary of larger project durations if they must comply with the accessibility standards.

6.2.1 Recommendations and expected results following the focus group analysis:

1. Information should be documented regarding standards and best practices of accessibility for organizations, so that they may implement them in their Web platforms. To document the available technologies to create more accessible Web applications allows:

- a. An improvement of sector knowledge and to support better business strategies in corporations, gaining more efficient solutions; with better support for the development of accessible websites, decision making will be far more easy and efficient (Henry, 2005).
 - b. The adoption of concrete measures with bigger impact and with lower cost, improving efficiency;
 - c. A standardization of the offering in the sector and a leveling according to the upper limit, respecting accessibility rules; the harmonization of accessibility standards is extremely important and very much needed, because it will allow the creation of a unified market for authoring tools that will produce conformant content. This unified market, in turn, will drive more rapid development of accessible Web content mostly due to the fact that with these standard compliant authoring tools, the developers would only have to learn one consistent set of guidelines and implementation techniques, rather than having to learn many different guidelines. This would allow developers to create accessible websites in a more efficient and cost-saving manner (Brewer, 2006).
2. Build evaluation tools to test websites, and/or inform about existing ones, allowing non-technical people to evaluate their applications, to see if they accomplish the accessibility standards or not; facilitate the documentation of failure points for future correction;
 - a. To allow better access to automatic test tools, at low cost;
 - b. To allow small and medium sized companies to know their compliance level and how to improve it;

- c. To allow a lower test duration cycle and the definition of specific measures to correct the identified failures;
 - d. Web accessibility evaluation tools can reduce the time and effort required to carry out evaluations. When used carefully throughout the design, implementation and maintenance phases of Web development, these tools can assist their users in preventing accessibility barriers, repairing encountered barriers and improving the overall quality of websites (Abou-Zahra, 2008).
3. Present a social and economic impact analysis about adoption of best accessibility practices, for better evaluation by corporations, allowing new business decisions supported by better strategies; the reason to make the Web accessible is equal access for people with disabilities, period. However, it is also useful to know the many additional benefits of Web accessibility. It is often easier for organizations to allocate more resources to accessibility when they learn that it can increase their potential market, decrease maintenance efforts, and result in many other benefits. While the primary focus of Web accessibility is access by people with disabilities, for a broader business perspective, you can say that accessibility is about designing your website so that more people can use it effectively in more situations (Thatcher *et al.*, 2006).

People access the Web using a growing variety of technologies, customized with a growing variety of possible preferences and configurations. People with disabilities are included in this mix, but people without disabilities are included as well. By recognizing that this technological diversity exists and by developing Web content that complies with standards, Web authors can ensure that their websites are accessible to the broadest possible audience (AccessIT, 2009).

6.3.1 Recommendations for big corporations and public administration:

1. Follow W3C rules, levels 1, 2 and 3, according to reasonable limits, as this;
 - a) Will allow a regulation of the sector, the defining of metrics and objectives, without imposing impossible rules or rules that imply costs too high to achieve them;
 - b) Will allow the identification and recommendation of more assertive measures, needed to correct more common difficulties;
 - c) Will allow “to point the way”, leading by example.
2. Improve ergonomics and usability globally, as this will:
 - d) Allow a simplification of website usage;
 - e) Allow the achievement of a higher usage level of electronic services;
 - f) Allow those who are info-excluded the access to tools that may be of great importance to their day-to-day activity.

6.4.1 Recommendations for Web platform suppliers and manufacturers:

1. Educate suppliers to use/implement business accessibility standards, as this will;
 - g) Help companies to improve their accessibility levels, at lower costs;
 - h) Help companies to gain commercial success;
 - i) Aid companies in their Web presence and subsequently the whole economy;
2. Create alternative pages to all pages or functionalities that are not W3C compliant, allowing access to all people that need them;

- j) Will allow the info-excluded access to very important tools in their day-to-day activity;
 - k) Will allow all users the access to all functionality, even to the websites that are not triple “A” compliant. This way we guarantee unconditional access to all information and functionality, without eliminating the benefits of newer design and ergonomics, very useful to other user groups;
3. Include test phases in the development process, by people with disabilities, in a way so as to prevent future difficulties and adapt the applications in a more practical way;
- l) This will allow the achievement of goals with lower risk and lower cost, and faster too;
 - m) This will also allow the identification of new accessibility needs, that were unknown until the tests, and to correct them;
4. Create new legal mechanisms that apply to public websites and also to private entities;
- n) Allows the regulation and leveling of both sectors;
 - o) Allows the standardization of accessibility levels for end users;
5. Create auditing institutes that guarantee accessibility levels, applying severe penalties to companies that don't apply accessibility improvements in their Web platforms;
- p) Allows to achieve global accessibility goals;
 - q) Allows penalties to be applied to incompetent entities;
 - r) Allows penalties to be applied to entities with a dishonest market approach;

s) Allows the protection of the investment of more credible companies which invest according to the law, and makes public recommendations to achieve compliance levels.

6. Include accessibility and usability issues in academic programs of higher colleges, referring to information technologies and communication; there are a significant amount of barriers slowing down the creation of accessible Web content. However, there are ways to break down these barriers. One of these ways is by including accessibility subjects in education programs (Yu, 2002).

t) Allows the improvement of the global knowledge level, permitting a more complete definition of future strategies;

u) Allows the reduction of average market costs for competent consultants in this field of expertise;

7. Support projects with the goal of building more accessible solutions for all citizens (acessibilidade.gov.pt, CERTIC – UTAD, etc.);

v) Demonstrates that the standards and rules are able to be implemented and are viable;

w) Allows the giving of examples and the defining of best practices.

8. Evaluate the more well-known Web platforms every year regarding their accessibility compliance, in such a way so as to guarantee a consistent level in accessibility standards;

x) Guarantees the future maintenance of goals already achieved, avoiding a regression;

y) Guarantees continuous improvement;

9. Build alternative interfaces, bringing them closer to natural language (voice, chat, speech);

z) Reduces barriers for users with basic difficulties (of knowledge in informatics usage or with disabilities – info-excluded);

aa) Allows the use of and access via new channels, such as telephones, PDAs or other equipment;

bb) Simplifies buying processes in the web environment, or the search for information, improving the efficiency of Web platforms;

10. Consider the impact of Web 2.0 on accessibility. Assure accessibility rules and availability of Web services between entities;

cc) Better prepares for evolution, assuring the success of the strategy to follow;

dd) Optimizes business and support processes inside organizations, or between organizations, ensuring business continuity;

ee) Allows innovation, the building of new kinds of user interfaces, resulting in new and better functionality and ensuring accessibility rule compliance.

7. Current and Future Research Efforts – WCAG2.0

The W3C Web Accessibility Initiative has created the second version of Web Content Accessibility Guidelines – WCAG 2.0. Although the present study gives a rather clear perspective on what the accessibility levels of Portuguese websites are, we also believe that the next step to be taken is the use of the 2.0 version of the W3C Web Content Accessibility Guidelines (W3C, 2008a). The use of these new guidelines

would help, not only to make comparisons between the accessibility evaluation results achieved with the 1.0 version and with the 2.0 version, but also to present a new and more up-to-date characterization of Portuguese Web accessibility. Despite this, at the time of the evaluation that is the foundation of our paper, the WCAG 1.0 was the only valid regulation. When WAI published the present 2.0 version of the guidelines, we then decided to undertake a new evaluation task, aiming to achieve a complete accessibility evaluation against these new guidelines.

As we searched for a tool that was capable of evaluating a website against WCAG 2.0 we acknowledged that the majority of these tools weren't capable of evaluating a webpage against this new version of the accessibility guidelines. As a result of this, we talked to the company that produced TAW3 with the goal of acquiring a version that allowed an automatic evaluation of an entire website against WCAG 2.0. However, the version of this tool that can evaluate Web pages against WCAG 2.0 is still in a Beta version and thus only allows an evaluation of a single webpage at a time. Despite all the referred limitations we still considered an analysis of the 1st page (homepage) of each website to be relevant, against the new version of the accessibility guidelines. We assume this relevancy due to the fact that, in the majority of cases, this first page presents itself as an indicator of the accessibility level of its website.

As we took into consideration the limitations of the evaluation tool that we were using, we decided to only evaluate a part of our target group (the 1,000 largest Portuguese enterprises) and thus achieve results that could indicate some sort of tendency and allow some sort of comparison with the results from the evaluation against the WCAG 1.0.

The following figure presents the results obtained with the accessibility evaluations against the WCAG 2.0.

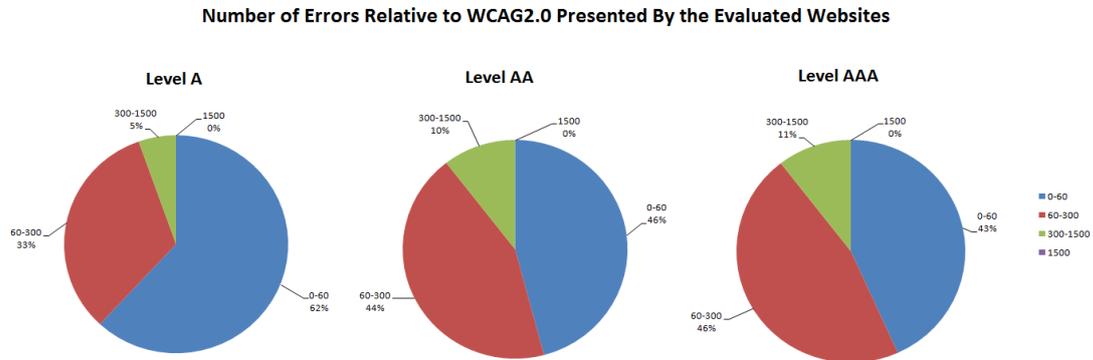


Figure 5 – Distribution of the Accessibility Errors Relative to the WCAG 2.0.

As we can see in figure 5, the results gathered from the referred evaluation present themselves in some respects better than those that resulted from the accessibility evaluation against the WCAG 1.0.

If we extrapolate the above results and assume that the full evaluation of the target group websites against WCAG 2.0 will reflect the reality of each website homepage, some indicators result. One of these indicators is the number of detected errors. This value has decreased significantly, what we believe can be assumed as an improvement in the accessibility levels according to the present W3C patterns. Another indicator, that not only results from the accessibility evaluation itself but also from the decreasing number of detected errors, is the fact that the 2.0 version of the W3C Web Content Accessibility Guidelines is more close to reality than its predecessor.

8. Conclusions

With this study we managed to achieve our initial goal which was to deliver indicators on the actual accessibility levels presented both by the 1,000 best Portuguese SMEs and by the 1,000 largest Portuguese enterprises. Alongside this, we also managed to conduct a simple comparison between the results of both parts of the target evaluation group.

As the presented results demonstrate, a considerable number of accessibility errors were detected on all of the websites belonging to the target group, without exception. This fact indicates that the accessibility levels presented by the websites of the 1,000 best Portuguese SMEs and by the websites of the 1,000 largest Portuguese enterprises are indeed relatively low according to the W3C WCAG1.0 standards because, for the majority, they aren't even conformant with the lower accessibility conformance level.

Another consideration that resulted from this work was the unveiling of the number of enterprises whose websites couldn't be evaluated. Of the 1,000 largest Portuguese enterprises, only 777 of them had online and TAW3 compatible websites that could be evaluated. Of the 1,000 best Portuguese SMEs, only 642 of these had online and TAW3 compatible websites that could be evaluated.

Comparing the results from both "parts" of the target evaluation group (the 1,000 best Portuguese SMEs and the 1,000 largest Portuguese enterprises respectively), we can confirm that the accessibility levels are better in the SME websites than in the largest enterprise websites. This happens in all three error priorities. With this said, it is possible to assume that there might not be a direct relation between the size or the sales revenue of an enterprise and the accessibility

levels of its website, given the better evaluation results presented by the SMEs. With this in mind, we believe that the “non-implementation” of accessibility features, in a website, is surely more related to decision-making reasons than to technical flaws.

A major contribution of the article is the series of recommendations and suggestions for improvements we put forth, considering the typical user’s needs and the main difficulties we identified, both in the research and in the Focus Group discussions. Those recommendations are referred to with importance and priority, alongside with the expected impact and result of each measure.

Finally, analyzing the results of the evaluation of the 1,000 largest Portuguese enterprises against WCAG 2.0, we can perceive that there’s a significant improvement of the accessibility levels when compared to the results achieved by the same Websites against WCAG 1.0. These indicators show, in our opinion, that W3C’s goal of creating more usable and practical Web content accessibility guidelines has been achieved.

References

Abou-Zahra, S., 2008. *Selecting Web Accessibility Evaluation Tools*. Web Accessibility Initiative (WAI) [accessed 5th of May, 2009]; Available at: <http://www.w3.org/WAI/eval/selectingtools.html>.

AccessIT, 2009. *How does accessible web design benefit all web users?* [accessed 6th of June, 2009]; Available at: <http://www.washington.edu/accessit/articles?1197>

Bradbard, D.A., & Peters, C., 2010. Web accessibility theory and practice: An introduction for university faculty. *The Journal of Educators Online*, vol.7(1), January, pp.1-46.

Brewer, J., 2006. *Why Standards Harmonization is Essential to Web Accessibility*. [accessed 20th of May, 2009]; Available at: <http://www.w3.org/WAI/Policy/harmon>.

- Carter, J., & Fourney, D., 2004. Using a Universal Access Reference Model to identify further guidance that belongs in ISO 16071. *Universal Access in the Information Society*, 3(1), pp.17-29.
- Chisholm, W.A. & Henry, S.L., 2005. Interdependent components of Web accessibility. *Proceedings of the 2005 International Cross-Disciplinary Workshop on Web Accessibility (W4A)*, pp. 31-37.
- CTIC, 2008. *¿Qué es TAW?* [accessed 9th January, 2008]; Available at: <http://www.tawdis.net/taw3/cms/es/infotaw/que.html>.
- Deslauriers, J.P., 1991. *Recherche qualitative: Guide Pratique*. MacGraw-Hill, 1991.
- EU, 2002a. *Delivering eAccessibility*, Commission of the European Communities.
- EU, 2002b, *eEurope 2002: accessibility of public websites and their content*. European Community Official Journal. Available at: <http://www.legi-internet.ro/index.php?id=149&L=2>.
- EU, 2003. *eEurope 2005 Action Plan*. Europe's Information Society Thematic Portal. Available at: http://ec.europa.eu/information_society/eeurope/2005/all_about/action_plan/index_en.htm.
- EU, 2005. *Challenges for the European Information Society beyond 2005*. [accessed 5th February, 2009]; Available at: <http://europa.eu/scadplus/leg/en/lvb/l24262.htm>.
- Exame, 2007. As 1000 Melhores PME 2007. *In Exame Edition 297*. Available at: <http://exame.edimpresa.viatecla.pt/especiaisdetalhe.aspx?channelid=4E23AD7D-3F76-46F4-8E5D-4FD7B4BB829C&contentid=DC1E8770-7256-4833-92CF-3B2C5A6B1221>
- Fern, E.F., 1982. Why do focus groups work: a review and integration of small group process theories, in *Advances in Consumer Research*, A. Mitchell, ed. St. Louis: Association for Consumer Research. pp. 444-451.
- Fortin, M.-F., 1999. *O Processo de Investigação: Da concepção à realização*. Lusociência - Edições Técnicas e Científicas, Lda.
- Fourney, D., & Carter, J. *Ergonomic accessibility standards*. Department of Computer Science, University of Saskatchewan, Canada, pp.1-6. [accessed 10th of February, 2010] Available at: <http://userlab.usask.ca/papers/IEA06DF-JC.pdf>.
- Gurstein, M., ed., 2000. *Community Informatics: Enabling Communities with Information and Communications Technologies*. 1st Edition, IGI Global.
- Henry, S.L., 2005. *Essential Components of Web Accessibility*. Web Accessibility Initiative (WAI) [accessed 15th of June, 2009] Available at: <http://www.w3.org/WAI/intro/components.php>

INE, 2002. *Censos 2001 – População residente com deficiência segundo o grau de incapacidade e sexo*.

INE, 2007. *1000 Maiores empresas de 2005 tendo em conta o volume de negócios*. National Institute of Statistics: Lisbon.

International Organization for Standardization ISO TS 16071, 2002. *Ergonomics of human system interaction — Guidance on accessibility for human-computer interfaces*.

International Organization for Standardization ISO 9241-171, 2008. *Ergonomics of human-system interaction – Guidance on software accessibility*.

Kern, W., 2008. WEB 2.0 – End of accessibility? Analysis of most common problems with Web 2.0 based applications regarding web accessibility. *International Journal of Public Information Systems*, vol. 2, pp. 131-154.

Liikanen, E., 2003. *Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises*. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32003H0361:EN:HTML>

McDonald, W.J., 1992. The influence of moderator philosophy on the content of focus group sessions: a multivariate analysis of group session content. In: V. Kumar, editor. *Enhancing Knowledge Development in Marketing*. Chicago: American Marketing Association, pp. 540-545.

McDonald, W.J., 1994. Provider perceptions of focus group research use: a multi-country perspective. *Journal of the Academy of Marketing Science*, vol. 22(3), pp. 265-273.

Mendenhall, W. and Sincich, T.L., 2007. *Statistics for Engineering and the Sciences*. 1995: Prentice Hall.

Miles, M.B. and Huberman, A.M., 1994. *Qualitative Data Analysis*. 2nd ed, Thousand Oaks, California: Sage Publications.

Myers, M.D., 1997. Qualitative Research in Information Systems, *MIS Quarterly*, vol. 21(2), pp. 241-242.

Michael Parent, R. Brent Gallupe, Wm. David Salisbury and Jay M. Handelman 2000. *Information & Management*, Volume 38, Issue 1, October 2000, Pages 47-58.

Nielsen, J., 2002. Foreword. In: *Maximum accessibility: Making your web site more usable for everyone*. Addison-Wesley Professional, pp. xix-xxi.

Oxford, 2010. AskOxford – Compact Oxford English Dictionary. [Accessed 8th February 2010]. Available at: http://www.askoxford.com/concise_oed/accessible?view=uk.

- Slatin, J., & Rush, S., 2002. *Maximum accessibility: Making your web site more usable for everyone*. Addison-Wesley Professional.
- Sócrates, J., 2007. Portuguese Ministers Council Resolution N.155/2007, *Diário da República Portuguesa*.
- Stewart, D.W. and Shamdasani, P.N., 1990. *Focus Groups: Theory and Practice*. Newbury Park: Sage Publications.
- Strauss, A. and Corbin, J., 1990. *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. Newbury Park, California: Sage Publications.
- Thatcher, J., Kirkpatrick, A., Urban, M., Lawson, B., Henry, S., Burks, M., Waddell, C., Heilmann, C., Rutter, R., Regan, B., Lauke, P., 2006. *Web accessibility: Web standards and regulatory compliance*. friends of ED.
- UMIC, 2005a. *Estudos sobre Acessibilidade aos Conteúdos Web*. [accessed 15th January, 2008]; Available at: <http://www.acesso.unic.pt/estudos.htm>.
- UMIC, 2007. *UMIC - Empresas*. Agência para a Sociedade do Conhecimento: Lisbon. Available at: http://www.unic.pt/index.php?option=com_content&task=section&id=8&Itemid=61
- Vector21, 2007. *Relatório Vector21 Sobre a Acessibilidade Web em Portugal*. [accessed 26th November, 2007]; Available at: <http://www.vector21.com/index.php>.
- WAI, 2005. *Accessibility Guidelines: Web Content Accessibility Guidelines 2.0*. Available at: <http://www.w3c.org/TR/WCAG20>.
- W3C, 1999. *Web Content Accessibility Guidelines 1.0*. Available at: <http://www.w3.org/TR/WAI-WEBCONTENT/>.
- W3C, 2005. "Social Factors in Developing a Web Accessibility Business Case for Your Organization." Retrieved Available at: <http://www.w3.org/WAI/bcase/soc>.
- W3C, 2006. *Conformance Evaluation of Web Sites for Accessibility*. Available at: <http://www.w3.org/WAI/eval/conformance.html>.
- W3C, 2008a. *Web Content Accessibility Guidelines 2.0*. Available at: <http://www.w3.org/TR/WCAG20/>.
- W3C, 2008b. *WAI Mission and Organization*. [accessed 18th January 2009]; Available at: <http://www.w3.org/WAI/about.html>.
- W3C, 2008c. *Web Content Accessibility Guidelines (WCAG) Overview*. [accessed 21st January 2009]; Available at: <http://www.w3.org/WAI/intro/wcag.php>.
- Webster's, 2010. Webster's Online Dictionary. [Accessed 8th February 2010]; Available at: <http://www.websters-online-dictionary.org/definition/accessibility>.

Wenner, C., 2008. *ICT for Citizens and Businesses*. Available at:
http://cordis.europa.eu/ist/directorate_h/index.html.

WHO, 2006. *Disability and Rehabilitation: WHO action-plan 2006 – 2011*.

Yu, H., 2002. *Web Accessibility and the law: recommendations for implementation*.
Library Hi Tech, vol. 4, pp.406-419.