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Enterprise Web Accessibility Levels Amongst the Forbes 250: Where Art Thou O Virtuous Leader?

Ramiro Gonçalves · José Martins · Jorge Pereira · Manuel Au-Yong Oliveira · João José P. Ferreira

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Abstract The research team measured the enterprise web accessibility levels of the Forbes 250 largest enterprises using the fully automatic accessibility evaluation tool Sortsite, and presented the compliance of the evaluated websites to WCAG 1.0, WCAG 2.0 and Section 508 accessibility levels. Given the recent attention to organizational leaders having ethical duties towards their dedicated employees, we propose that 'societal citizenship behaviour' concerns ethical duties of organizational leaders towards society in general and in particular to those who have less means to assert their needs. In effect, we found enterprise website accessibility levels to be in need of significant improvement. An interpretation of a positive path forward to better enterprise website accessibility levels is put forth based on a focus-group interaction and using BNML—a novel Business Narrative Modelling Language.

Keywords WCAG · Section 508 · Website evaluation · Website accessibility levels · BNML

R. Gonçalves (✉) · J. Martins · J. Pereira
Universidade de Trás-os-Montes e Alto Douro, GECAD/UTAD, Vila Real, Portugal
e-mail: ramiro@utad.pt

R. Gonçalves · M. A.-Y. Oliveira · J. J. P. Ferreira
INESC TEC (Formerly INESC Porto), Faculdade de Engenharia, Universidade do Porto, Rua Dr. Roberto Frias, 378, 4200-465 Porto, Portugal

M. A.-Y. Oliveira
Department of Economics, Management and Industrial Engineering, University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal

Introduction

An objective of this article is to increase global awareness of the enterprise web accessibility problem. In order to achieve this objective, we performed a study in which we chose as our sample for analysis the 250 largest enterprises of the year 2009 according to the Forbes listing of 'The Global 2000' (Forbes.com 2011). We are in agreement that organizational leaders have ethical duties towards their dedicated employees (Lee 2010; Caldwell 2011). We propose further, however, that 'societal citizenship behaviour' (SCB) is also essential, concerning ethical duties of organizational leaders towards society in general and in particular to those who have less means to assert their needs. The largest 250 Forbes enterprises were seen to be a good example of where one should find SCB as this set of companies should set the standard which other smaller companies (with less financial means) should follow. Our research results, however, have proven otherwise.

In the era of the Internet, web accessibility, or a lack of it, can constitute a serious barrier to integration in society and not only to commercial transactions. Corporations are 'very powerful modern institutions that enjoy many of the legal rights of humans' (Beets 2011, p. 193), and so it is only fitting that corporate websites thus be made accessible to all, and not only to the privileged, even if they are the minority.

The effect of leaders on followers outside the organization has been less researched than the leader–follower relationship within organizations. For example, recent research by Hayibor et al. (2011) discusses value congruence between CEOs and their top management teams. Interestingly, however, servant leadership (Greenleaf 1970; McGee-Cooper and Trammell 2010; Spears 2010) brings to the fore the notion of leadership as a service,

where all are winners due to a motivation to serve, including customers and the community at large. Leaders can also be servants, according to the visionary Greenleaf (cited in Trompenaars and Voerman 2009) and servant leadership is a management style which combines serving and leading at the same time. What our research would also like to emphasize is the need for the effects of leadership to be felt also on corporate followers or potential or actual customers who fall outside the hierarchical relationship within organizations. Being followers, often even avid followers, potential or actual customers deserve to be considered worthy of 'servant service' as well. Potential and current customers are fundamental stakeholders in a company's future and service is due not only to salary-earning employees. Thus, websites must be made accessible to all as a service which companies must provide. 'A servant-leader is servant first' (R. K. Greenleaf quoted in Spears 2010, p. 11). Indeed, Spears (2010) does focus upon the inclination to serve others and the need to build a better and more caring society; and positive change within the Forbes 250 (our sample) is seen to be instrumental due to the far-reaching effect they have in society.

In an ultra-high-tech age, technology can alienate or connect citizens to organizations (Gonçalves and Oliveira 2010). There is an area of research which has dedicated attention to universal design, to universal accessibility and to 'the importance of feeling included in groups and ultimately in society as a whole' (Gonçalves and Oliveira 2010, p. 259). This will make for healthier people who are also more resilient. Furthermore, it makes commercial sense to make our corporation's products and services available to as many people as possible. We thus feel that this topic of web accessibility and the notion of service to followers outside the organization could not be more worthwhile.

The Council of the European Union (EU 2010) also brought forth important conclusions concerning digital connectivity in Europe and the subject of bottlenecks, which need to be tackled, is also present. In their communication, they stated that 'The wider deployment and more effective use of digital technologies can provide Europeans with a better quality of life through, for example, better health care, safer transport, new media opportunities and easier access to goods and services' (EU 2010, p. 2). Better quality of life throughout society is an aim of our research, and this article is organized to address corporate website accessibility as follows: first, we focus on defining web accessibility; then we evaluate and analyse the results of our studies, using Sortsite and the Business Narrative Modelling Language (BNML) (Oliveira and Ferreira 2011); and, finally, we advance conclusions of our research.

Web Accessibility: Definition and Regulation

The second section of this article presents an overview on the concepts behind the web accessibility issue.

An initial presentation of the existent definitions of accessibility is made, as well as a brief description of the various perspectives surrounding the theme. We also present arguments and elements on how accessibility can affect and influence one's quality of life. We finalize this section by describing, from a macro point of view, other studies that present similar intents and methodologies.

Contextual Background

According to W3C (2005) and Thatcher et al. (2006), the widespread use of Information and Communication Technologies (ICT) in enterprise markets and in cultural and social activities is providing a clear need for high accessibility levels to these technologies. If this need is satisfied, the benefits emerging from the use of ICT will be available to all, including those with impairments or disabilities.

The ability of a person with disabilities to access a given service or product or execute a given activity in an equal manner as a person who does not have any kind of disability, is the definition of accessibility we adopt in our article. In the world of ICT, the term accessibility can be simply defined as the existence of interfaces that can be used, acknowledged and perceived in the same manner by all users, whether they are disabled or not (W3C 2008a).

When we pass over to the world of the web, we also need to have the concept of accessibility very present. This kind of accessibility, commonly known as 'Web Accessibility' can be characterized as the existence of web interfaces that, just as with non-web interfaces, must be perceivable and usable in the same easy way by both users with and without disabilities (W3C 2008a; Bradbard and Peters 2010).

According to the World Wide Web Consortium (W3C), the existence of accessibility in web content is directly related to factors such as the web content developers' technical and personal skills, the ability of the existing authoring tools to provide a mechanism for creating accessible web content and also to the capabilities of the accessibility evaluating tools that evaluate web content against the existent web accessibility regulations (Brewer 2006; Chisholm and Henry 2005). Although W3C considers that the web content developers' technical capabilities are one of the issues related to the amount of accessibility faults, these same developers claim that this issue is mainly due to the difficulty in interpretation/implementation of the existent regulations and due to the high level of difficulty in using not only the available test tools but also the existent development tools that consider

web accessibility features (Trewin et al. 2010). Accessibility has therefore to be looked at with its deserved care and attention 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 (W3C 2008a; Shneiderman and Hochheiser 2001; Easton 2011).

Currently, several organizations, besides W3C, bring forth studies regarding the regulation and spreading of web accessibility content. Amongst these are the International Organization for Standardization—ISO (ISO 2002, 2006), the European Union (EU 2005, 2006, 2010) and the United States of America Congress (ITAW 2010).

Guidelines, Legal Regulations and Global Panorama

Web accessibility has been the core subject of several regulations across the World (Becker 2008; WHO 2006). This can be perceived by analysing not only international regulations but also the numerous national regulations that aim to regulate and implement web accessibility.

Examples of international regulations are those proposed by the International Organization for Standardization—ISO TS-10071, ISO 9241-110 and ISO 9241-171 (ISO 2002, 2006, 2008). Other examples of international regulations are the W3C's Web Content Accessibility Guidelines 1.0 (WCAG 1.0) and the Web Content Accessibility Guidelines 2.0 (WCAG 2.0).

When, in the late 1990s, the W3Cs WAI initiative was founded, its goal was to create several tools that would help in improving web accessibility levels (W3C 2008b). One of the tools created by the referred initiative was the WCAG 1.0. These were a series of indicators gathered in a document fashion that explained how to create accessible web content. However, as technologies evolved, this first version of the accessibility guidelines became obsolete and needed to be updated. This evolution became a reality when WAI published WCAG 2.0. This newer version of accessibility guidelines presented several differences and only a few similarities to its predecessor (W3C 2008a). WCAG 2.0 also makes use of the functional concept of principles [used in some other works, such as ISO Dialogue Principles (ISO 2006) and Nielsen's Usability Principles (Preece et al. 2002)].

WCAG 2.0 was defined according to the following four principles (W3C 2008a):

- Be perceivable—information and user interface components must be presented to users in ways that they can perceive them. This means that users must be able to perceive the information being presented (it cannot be invisible to all of their senses);
- Be operable—user interface components and navigation must be operable. This means that users must be able to operate the interface (the interface should not require interaction that a user is not able to 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 so that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

Although there are several differences between WCAG versions 1.0 and 2.0, we can still see some similarities. One of these similarities, though mild, is the definition of conformance levels. WCAG 1.0 checkpoints were divided into a certain priority (1, 2 or 3) where the conformance level of a website was due to meet these same checkpoints in accordance with the following criteria:

- Conformance level A—implementation of all priority 1 checkpoints (those that must be met);
- Conformance level AA—implementation of all the checkpoints of priority 1 and 2 (those that should be met);
- Conformance level AAA—implementation of all the checkpoints of priority 1, 2 and 3 (those that can be met).

The WCAG 2.0 standards are organized according to a set of success criteria of a certain level of importance (A, AA and AAA) and are similar to what existed in WCAG 1.0, where the conformance levels of websites was directly linked to the fulfilment of the success criteria, this relationship being described as follows:

- Conformance level A—compliance with all success criteria for level A (those that are indispensable for the document information to be accessible to all). It is the lowest level of conformance;
- Conformance level AA—meeting all success criteria for levels A and AA (those that are very important for the document information to be accessible to all);
- Conformance level AAA—compliance with all success criteria for levels A, AA and AAA (those that even being optional, make information more easily accessed by all). Presents itself as the highest level of conformance and one that ensures that information is available to all.

Besides the W3Cs, which have existed for almost one and a half decades, and which are making efforts towards promoting and regulating web content accessibility, this issue has also been in the agenda of several countries, such as the USA, for a long time.

The concern in the USA with disabled people has been in existence since the 1973 Rehabilitation Act. However, with the introduction of Electronic and Information Technologies—EIT in Federal Agencies, the need for these technologies to become accessible to all became clear. In order to satisfy this need, in 1998, the USA Congress amended existing regulations, forcing all Federal Agencies to transform the referred technologies for them to be accessible to all citizens, including those with impairments. With the knowledge acquired by the application of these regulations, the scene was set for the creation of the 'Section 508' law (ITAW 2010; USAB 2010). By enforcing this law, the USA Congress intended to remove all of the different types of barriers when accessing ICT allowing, as a direct result, disabled people to benefit from these same technologies and from a new range of opportunities.

Although Section 508 was created to intervene in government institutions, not all have adopted this ruling because it is more directed to the websites of high levels of government. In order to solve this problem, some local government authorities have created their own regulations based on Section 508 itself, trying to legally cover the local government institutions. Apart from this issue, there is still the problem of the difference in coverage between the statutory public websites and those belonging to the private sector. Still, there is a conceptualization that, not very widespread or accepted in an assertive manner, Title III of the Americans with Disabilities Act (ADA), may somehow regulate the websites of private entities, provided that such websites or companies have an activity that fits in a set of predefined activities.

From WCAG 1.0 (1999) to WCAG 2.0 (2008)

One of the main features of the world of ICT is its constant evolution and change. This reality made the WCAG 1.0 (which was mainly technical) out-of-date in only a few years of existence. This fact, coupled with a need for facilitating the understanding and use of policies and the right way to test them (automatically or manually), forced the W3C to carry out the process of creating a newer, more current and comprehensive version of the Web Content Accessibility Guidelines, that could respond to most of the criticisms made to WCAG 1.0.

Given the aforementioned situation, on 11 December 2008, the W3C published the WCAG 2.0, representing the evolution and adaptation to a new situation regarding concerns about the accessibility of web content.

The development process of WCAG 2.0 represented in itself a break from traditional methodologies. This was mainly because this time the W3C chose a collaborative development methodology, thus taking advantage of the feedback that various Internet users (including several specialists) and several international institutions were giving at the same time that W3C launched draft versions of the document that would eventually come to be the final version of WCAG 2.0.

Another innovative aspect of the WCAG 2.0 development process was the creation of manuals and handbooks on how to transit from WCAG 1.0 to WCAG 2.0, and the creation of technical documents that could/should be used to implement policies, as well as other support materials.

While the WCAG 1.0 was mainly composed of technical nuances, version 2.0 of the standards was more comprehensive, thus aiming to 'escape' technological limitations. This aspect has made the WCAG 2.0 become much more targeted towards the majority of web technologies and more adaptable to future technological developments and innovations.

Despite the innovation presented by WCAG 2.0, this standard has been the target of several critics. The majority of these critics state that this new version of W3Cs accessibility guidelines still has faults and is still incoherent concerning some topics. One of the most important consequences of this discussion is the fact that several web content creators are still using WCAG 1.0 as the web accessibility standard when creating websites or making documents available online.

Web Accessibility and Usability

Although the general consensus is that usability can be viewed as a quality factor associated to all software applications, several definitions have been presented. These definitions vary according to the models that they are based upon.

According to Nielsen (1993), the concept of usability is not a closed definition, but a group of concepts, such as Learnability, Efficiency, Memorability, Few Errors and User Satisfaction. These principles can also be specialized and decomposed into finer-grained criteria, allowing for a wider group of validation criteria, methods and tools. As a result, usability is systematically and continuously evaluated, approached and improved upon (Nielsen 1992, 1993).

The standard that is currently accepted by the community of usability specialists is ISO's International Standard ISO 9241, according to which usability can be viewed as an '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' (ISO 1997).

As concerns accessibility, it can be viewed as an extent and complement to the concept of usability, defined above, as it sets down the conditions for users to achieve goals with effectiveness, with a high level of knowledge acquirement, while addressing, at the same time, the use of a given web content in a specific context (Matera et al.

2006; Lew et al. 2011). The usability of web content puts its focus on fewer errors occurring; the accessibility of web content aims for it to be used and accessed by everyone (Theofanos and Redish 2003; Hull 2004).

Web Accessibility: Similar Studies

There are several published studies regarding the web accessibility topic. These studies were mainly accessibility evaluations of a defined set of websites that, in their great majority, present results showing that the web accessibility levels of the evaluated websites is extremely low. Given the fact that these studies concern a universe of websites composed by both public and private entities, it is possible to claim that the web accessibility issue is global and not just a problem of a restricted group of entities (Kurniawan et al. 2001; Pernice and Nielsen 2001; Drews 2008; Cullen et al. 2009; Lazar et al. 2010; Gonçalves et al. 2011; Kurt 2011).

One of the international organizations that has been actively concerned with the web content accessibility issue is the United Nations—UN, through the Secretariat for the Convention on the Rights of Persons with Disabilities (SCRPD). One of the main UN achievements was the creation of the United Nations Enable website which aims to publish information on disability related topics and on the UNs work concerning disabilities. One of the UNs most significant actions towards web accessibility was the publication of a report that resulted from an audit, performed in collaboration with Nomensa, of the 100 leading websites from 20 countries from around the world (UN 2006). This audit used W3Cs WCAG 1.0 as the accessibility standard to test against and, as other studies with 'smaller' target groups also announced, its results indicated that the accessibility levels of the evaluated websites were very low. Despite presenting results similar to other web accessibility audits (including the one presented in the present work), this study also highlighted that several of the evaluated websites could be easily changed to be conformant with the web accessibility standards.

Evaluation and Analysis of Results

The existence of websites created with more emphasis on visual aspects rather than equal access to all users (Bradbard and Peters 2010) goes against the concept of web accessibility. This fact emphasizes the need for a valid and assertive effort to perform a web accessibility evaluation study to acknowledge what is the reality of the web content accessibility level.

Methodology

In order to proceed with a correct assessment of the accessibility levels presented by a given website, one should understand the suggested (or imposed) methods to be used for that process. W3C has published a series of indications and steps that one should follow to do a correct, impartial and technically flawless evaluation (W3C 2006). With this in mind, we have decided to follow W3Cs evaluation methodology. As a result of these decisions, several steps had to be taken before the start of the actual evaluation process. These steps are, according to W3C, the following:

- Definition of the evaluation scope;
- Definition of the evaluation tools;
- Definition of the proceedings for manual evaluation;
- Definition of the resulting reports.

To characterize the evaluation scope, we identified the evaluation criteria and defined the intended target group. Given our ambition for obtaining the best, most accurate and most foolproof results we decided to use USA Government Section 508 and W3Cs WCAG 1.0 and WCAG 2.0 'AAA' as the set of regulations used to serve as the evaluation conceptual basis. As concerns the target group, we chose the 250 largest enterprises of the year 2009 according to the Forbes 'The Global 2000' list (Forbes.com 2011).

Although W3C does not recommend any specific tool for evaluating the accessibility levels of a website, this consortium presents a list of tools that are able to do so and that have given proof of their value. From this list, we chose the 'Sortsite' tool because it delivers a fully automatic accessibility evaluation of an entire website and presents a simple and very easy to understand report of this evaluation (Sortsite 2010).

As a result of our time and human resources limitations, we had to put aside the manual evaluation process, even though we recognize that it may be important as a complement for an accurate and fully representative accessibility evaluation.

The reports that are going to be delivered as an outcome of the evaluation process are mainly statistical indicators gathered in tables and, also, bar charts presenting the dispersion of the existent accessibility errors and presenting the compliance of the evaluated websites to the accessibility indicators presented by Section 508, WCAG 1.0 and WCAG 2.0.

Target Group Analysis

For this project, we searched for a target group that could present itself as being solid and big enough to be

representative. At the same time, we sought a target group that could be important enough for the public eye. This search led us to Forbes Magazine and its 'best of' and 'largest' annual lists, more precisely to 'The 2009 Global 2000' list where the largest 2000 enterprises in the world are listed according to business volume. 'The Forbes Global 2000 are the biggest, most powerful listed companies in the world' (Forbes.com 2011). Given the dimension of the referred list, we decided that an evaluation that targeted the top 250 enterprises should also be significant and representative of a global reality. As a result, for the evaluation of the target group we chose the 2009 Forbes Magazine top 250 enterprise list. Of note is that 'the corporate dominance of the developed nations is steadily receding;' (Forbes.com 2011), and so these 250 corporations represent an ever more diverse global reality (including India, Mexico, Taiwan, Colombia, Russia, Thailand, Panama and Portugal). In the top twenty alone, we can see an assortment of companies from the USA, the Netherlands, Japan, the United Kingdom, Spain, France, China, Russia, Germany and Italy, with other countries being represented in the top one hundred—countries such as Brazil, Switzerland, Luxembourg, South Korea, Canada, Australia, Norway, Hong Kong, Finland and Saudi Arabia.

Although our initial target group had 250 members, following an initial analysis of these enterprise websites, we found that not all were compatible with the tool that we chose to use to proceed with this project and that the compatibility also diverged with the regulations/guidelines that were used.

When analysing the early results of the initial target group evaluation, we were able to perceive that not all of the target group websites could be evaluated.

As we can see in Fig. 1, only 94 % of the initial target group could be evaluated. The remaining 6 % could not be evaluated because the website structures and technology didn't allow Sortsite to proceed with an accessibility evaluation. It is a known fact that technologies such as Macromedia Flash and JavaScript pose several accessibility limitations to websites. This issue has also been transposed to the evaluation tools used to perform evaluation studies similar to the one presented, that when doing their work routines over a website built with one of these technologies, they tend to stop these routines because of difficulties in crawling within the web pages of those websites.

Given this situation, the accessibility evaluation could only be done for 236 websites instead of the initial 250.

In order to achieve results that could better represent the reality of each target group website, we carried out the accessibility evaluation on the totality of each of the website's pages. Still, the relative complexity of each of the target group websites was taken into account when analysing the evaluation results.

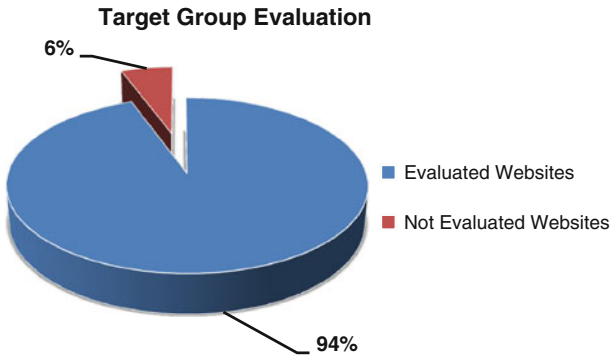

Fig. 1 Relation between the target group websites that were evaluated and those that were not

Evaluation Results

The evaluation starting point was the target group analysis. With this analysis we aimed to check the number of enterprises (belonging to the 2009 Forbes 250 largest) that had an available and tool-compatible website.

After defining the target group, the website evaluation step was started. The available websites were tested against both the W3C/WAI accessibility guidelines and Section 508 regulation with the help of the Sortsite tool. This test was done manually by introducing each enterprise website in the Sortsite tool and also by manually treating the returned results in a way that they could be analysed and statistically treated.

Keeping in mind the main goal for this project—reaching indicators for the accessibility levels of the Forbes 250 largest enterprises for 2009—we took into consideration the methodology defined above and started evaluating the target group websites. After reaching the evaluation results, we performed an initial analysis where it was possible to perceive the existence of several abnormal values that, in our opinion, could compromise the entire sample. In order to solve this situation, a statistical analysis had to be performed on the evaluation results. This resulted in a need for a statistical treatment that consisted of applying the outlier definition to the referred results (Mendenhall and Sincich 2007). A deviation of the experimental data that is being analysed is, according to Muñoz-Garcia et al. (1990) an outlier. However, this definition is simplified by Grubbs (1969), according to whom an outlier is a marked deviation from the remaining values of a data sample. Before deciding what should be done to the outliers, it is important to know the causes that lead to their appearance. In many cases, the reason for their existence determines how they should be handled. The main

causes that lead to the existence of outliers are: measurement errors, execution errors and the variability inherent in population elements (Figueira 2010; Gonçalves et al. 2011).

As a way to ensure that the final results were trustworthy, the outlier definition was used on of the results (WCAG 1.0, WCAG 2.0 and Section 508).

Figure 2 presents a schema of what was applied to the results in this statistical treatment stage.

After this treatment had been performed, we attained a new and more reliable sample of results. By applying some statistical calculations to these results we were able to present a simple and clear perspective of what the results were.

As we can see by analysing Table 1, the average number of errors per website is very high. This situation is common to all the guidelines/regulations used (the objective of all website evaluations is zero errors per website). Not only the average number of web accessibility faults is very high, but also the maximum number of errors that we've achieved is a serious indicator of the poor levels of web accessibility presented by the evaluated websites.

When analysing Fig. 3, it is possible to perceive that approximately half of the evaluated websites present more than 300 WCAG 1.0 priority 1 errors. Furthermore, 86 % have between 60 and over 500 errors. This fact indicates that, according to WCAG 1.0, the majority of the evaluated websites do not have the minimum requirements to be awarded even the lowest web accessibility conformance level (priority 1). We can also see that more than 85 % of the evaluated websites present more than 500 WCAG 1.0 priority 2 errors, which can be considered an extremely high number of errors and an indicator of the lack of web accessibility concerns taken into account during the development of the evaluated websites.

By analysing Fig. 4 its also possible to perceive that the number of WCAG 2.0 errors is extremely high. It is also possible to see that more than 85 % of the evaluated websites present more than 500 WCAG 2.0 level A errors. Although the majority (58 %) of the evaluated websites presents less than 30 WCAG 2.0 level AA errors, an even more significant majority (63 %) presents between 60 and 300 WCAG 2.0 level AAA priority errors.

Given the achieved results and according to WCAG 2.0, though level AAA errors are better than the A and AA categories, we still conclude that the evaluated websites do not present the desired web accessibility conformance levels, which indicates that according to this regulation none of the evaluated websites is accessible to all citizens.

As we can see in Fig. 5, the results of the web accessibility evaluation of the target group websites against the Section 508 regulation was not very different from the previously mentioned results. The majority of the evaluated websites present more than 500 Section 508 regulation errors. This is far more worrisome as the second biggest 'part' of the target group (22 %) still present a number of web accessibility errors between 300 and 500, clearly indicating the inexistence of conditions for those with impairments to access the target group websites and, therefore, not being able to use these resources as those without any disability can.

Although in the course of this study three different sets of standards for the accessibility of web content have been used, we can see that the vast majority of websites do not comply with those standards, not allowing them to be available for Internet users without limitation. This is clearly visible when we see that the results indicate that almost 90 % of the evaluated websites have more than 500 level A errors (WCAG 2.0), which in essence are based on

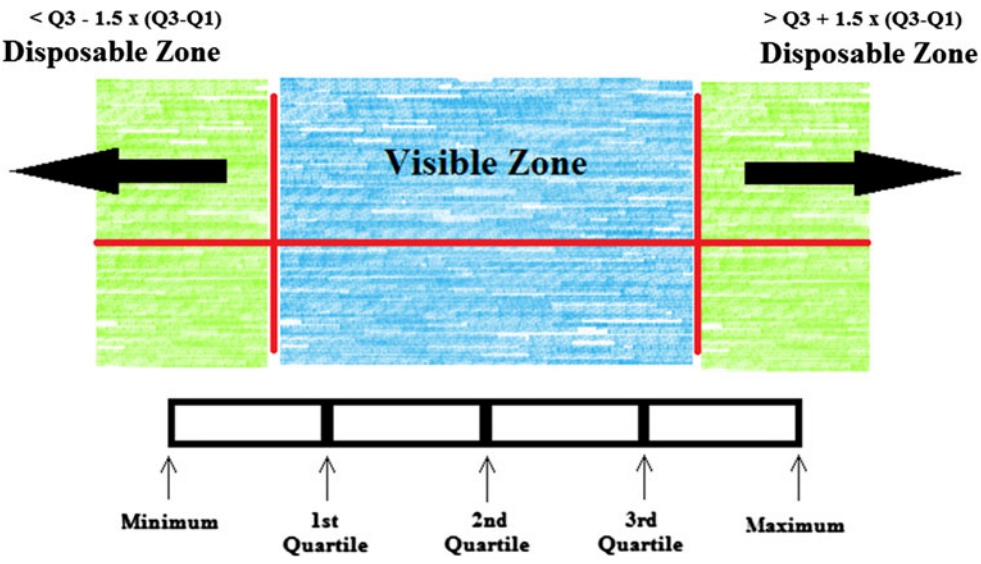

Fig. 2 Outliers' treatment schema

Table 1 Comparison of statistical data retrieved from the evaluation processes against WCAG 1.0, WCAG 2.0 and the Section 508 regulation

	WCAG 1.0			WCAG 2.0			Section 508
	P1	P2	P3	A	AA	AAA	
Avg.	402	1,909	169	1,351	27	185	550
SD	500	2,347	109	821	29	118	349
Min	0	3	0	2	0	0	2
Max	846	4,104	452	3,472	121	524	1,367

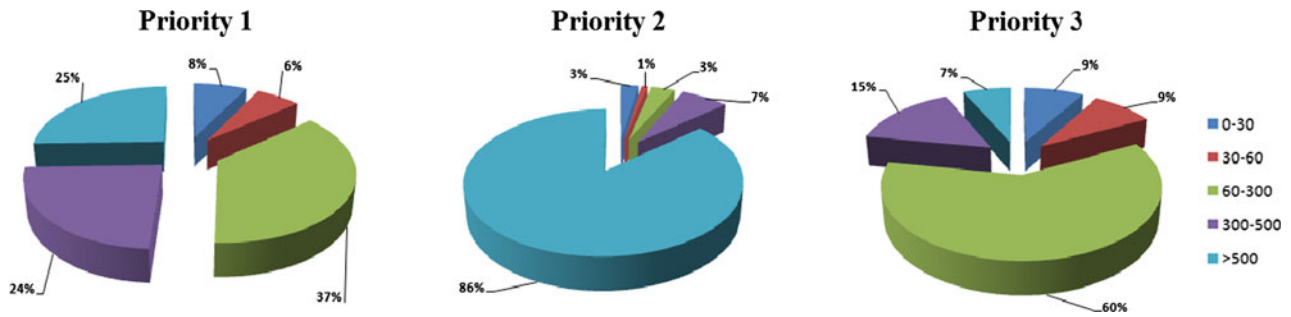

Fig. 3 Number of errors presented by the target group websites when evaluated against WCAG 1.0

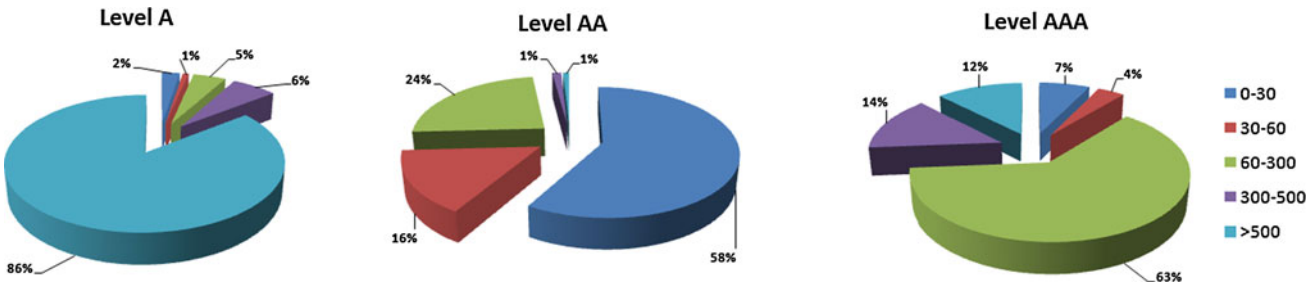

Fig. 4 Number of errors presented by the target group websites when evaluated against WCAG 2.0

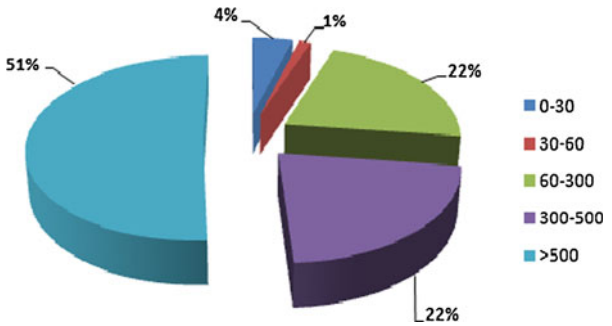

Fig. 5 Number of errors presented by the target group websites when evaluated against the Section 508 regulation

the type of errors that impose barriers to full access of the web content.

One of the basic principles of the Internet is its universality and its capability to connect people and organizations. By limiting access to available Internet and web content, we are denying to a very considerable population of the world the right to enjoy that same content which can be very useful for their day-to-day activities and to their (re) integration into society.

An Analysis of Research Results Using the Business Narrative Modelling Language

The BNML (Oliveira and Ferreira 2011) uses the stories told by relevant actors intervening in a process to create visual representations such as those in Figs. 6 (based on Allee 2008) and 7 (based on Oliveira and Ferreira 2011). Visual representations help achieve a deeper understanding concerning the stories told by individuals (Woodside 2010). BNML also serves as an analytic tool—a thinking technique—'used by analysts to facilitate the coding

process… deriving and developing concepts from data' (Corbin and Strauss 2008, p. 65). The need for BNML arose given that qualitative research efforts are seen to be inferior to more quantitative research efforts (Mason 2002). BNML seeks to provide more standardization across qualitative research efforts as it is based, for example, on the Enterprise Ontology (Uschold et al. 1998) and on predefined game patterns (Bjork and Holopainen 2005).

Figure 6 depicts the accessibility value network (Allee 2008) necessary to overcome web accessibility deficiencies and is the result of a focus-group interaction organized by the authors (Gonçalves et al. 2011). Portraying such value networks of particular areas is the first step of the BNML.

Seven global actors need to interact to improve website accessibility levels: accessibility experts, corporate financial professionals, website construction/correction tool providers, legislators, website builders, website auditors, and designated communication professionals. These actors (or roles) will engage in tangible and intangible transactions involving tangible and intangible deliverables (Fig. 6). Tangible transactions are those entered in the General Ledger ('T' accounts) and involving debit and credit transactions. We predict that initially the transactions will be mostly tangible (i.e. will cost money), as the necessary framework for web accessibility improvement will have to be set down and thus will require an investment by governing bodies. For example, corporate financial professionals will have to be aware of the strategic benefits of website accessibility and this awareness will have to be built up by designated communication professionals; website builders will have to be up-to-date concerning implementation techniques as well as concerning minimum accessibility requirements and this again will involve some activity by designated communication professionals; and legislators and website auditors will have to be up-to-date on advancements to determine and control the deployment of minimum accessibility requirements. Once an accessibility culture and community (assets visible in Fig. 7) have been built up costs should decrease to lower maintenance-type levels.

Figure 7 (BNML) indeed adds a timeline to Allee's framework and also shows the assets used and built in the accessibility value network. Thus, we can see that a partner network is built all along the sequence of events, as is an accessibility culture amongst the relevant value network players. Technical know-how is initially built and then used throughout the process. An accessibility community is a growing reality as the partner network evolves. Accessibility insights are built and used. An accessibility competence and philosophy are also results of the website accessibility improvement initiative.

The aforementioned assets are built and used along a pattern sequence (Bjork and Holopainen 2005), from alignment and cooperation between accessibility experts, communication professionals and legislators; to improved abilities of website builders. Tangible deliverables are exchanged throughout. Figure 7 is thus a roadmap for the change which needs to occur for website accessibility levels to improve worldwide.

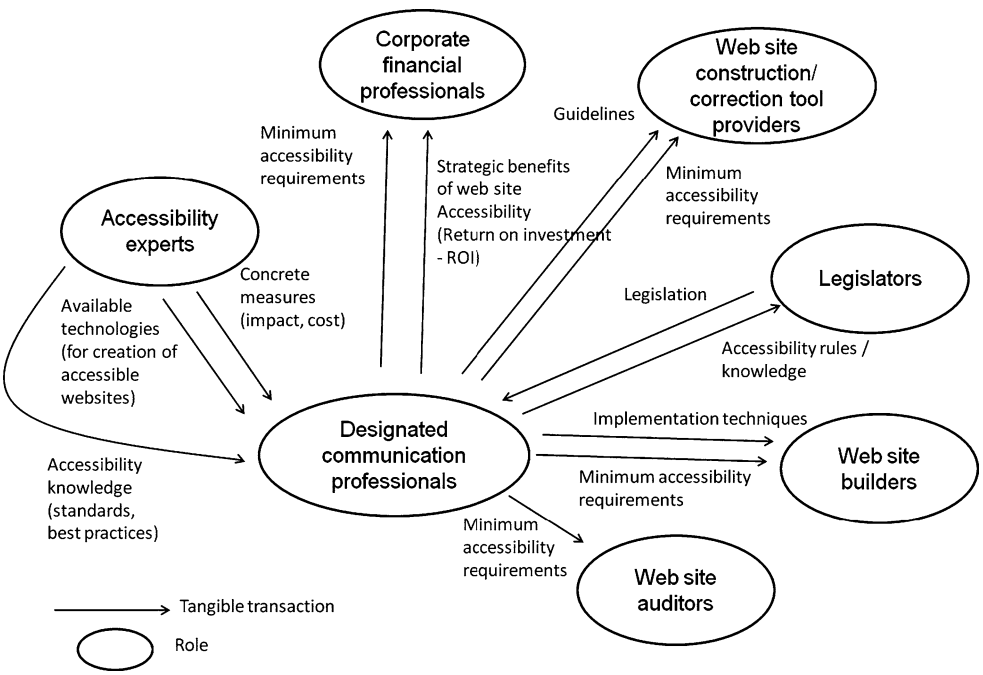

Fig. 6 Accessibility value network

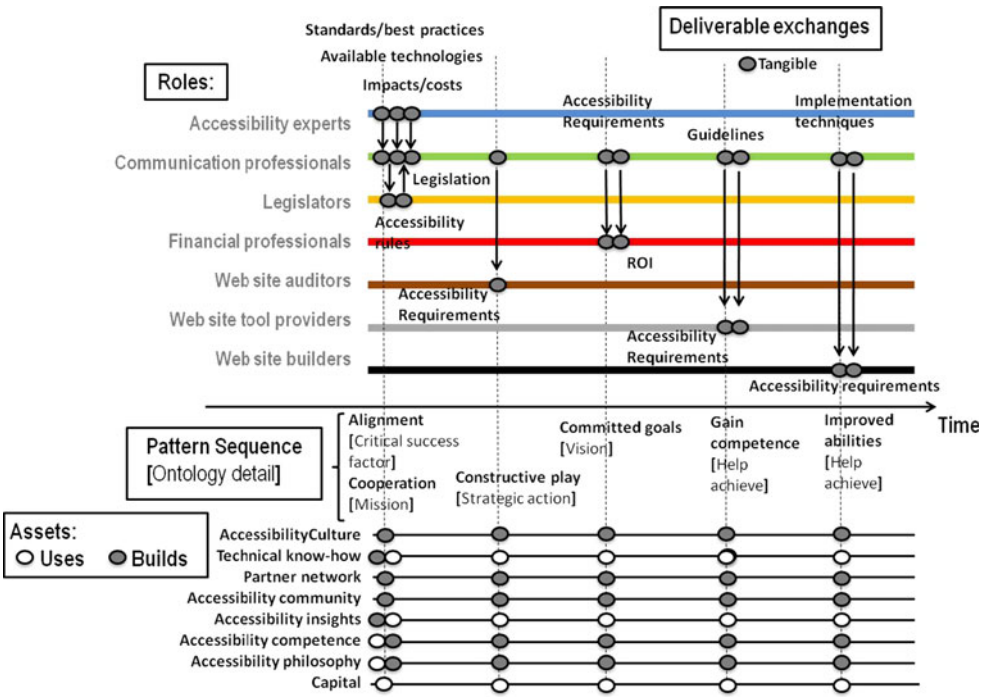

Fig. 7 BNML road map for improving website accessibility levels, worldwide

Our Vision of the Way Forward: Moving Away from Impairments and Towards a Greater Participation in Society by All

The novel BNML is composed of visual representations and by the narrative. By combining these two communication strategies we hope to drive home a deeper message. BNML tells stories, stories about people's lives. All people can be mobile and indeed are mobile in the stories of their lives. It is society that disables people. Figure 8 shows the storyline of disabled people in their role to overcome website accessibility problems. They need in fact to be very active.

Can disabled people be as mobile as virtuous CEOs/leaders? If society were to pay attention to the variety of needs of all members of society, then yes—virtuous CEOs of Forbes 250 companies, for example, would be equally as mobile as disabled people. Both CEOs and disabled people will have to play different but equally vital roles (with corresponding storylines) in the search for a solution to website accessibility issues, as Fig. 9 shows. In Fig. 9, we can see that disabled people and CEOs will cross paths several times.

Finally, Fig. 10 shows a complete BNML storyline view of our vision and what is needed to move away from impairments and towards a greater participation in society by all. Figure 10 is thus a depiction of the way forward towards greater accessibility. The grey ovals indicate social interaction. Social interaction occurs according to patterns—patterns such as First Person Views, Direct Information, Gain Competence, Constructive Play and Alternative Reality (each taken from Bjork and Holopainen 2005).

In Fig. 10, disabling websites have deliberately been placed at the bottom of the figure. Virtuous leaders will stay away from them, by having an awareness of Section 508 and WCAG 2.0—shown by the Direct Information pattern, an important 'influence factor' [an enterprise ontology term taken from Uschold et al. (1998)]. In sum, the way forwards will require a vision (Uschold et al. 1998)—and that vision needs to be supplied by First Person

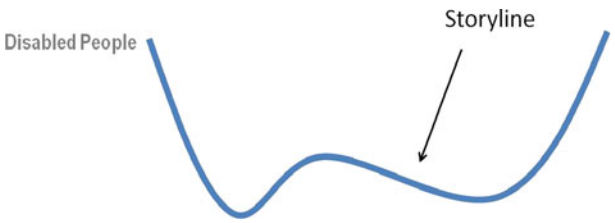

Fig. 8 A BNML storyline of disabled people actively working towards a solution to the website accessibility problem

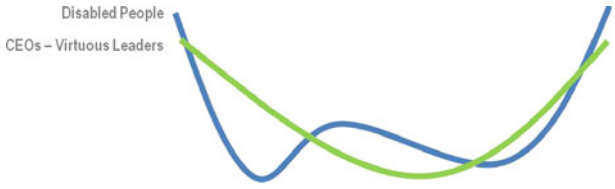

Fig. 9 BNML storylines of both virtuous CEOs and disabled people: both actively taking part in the search for a solution to the website accessibility problem

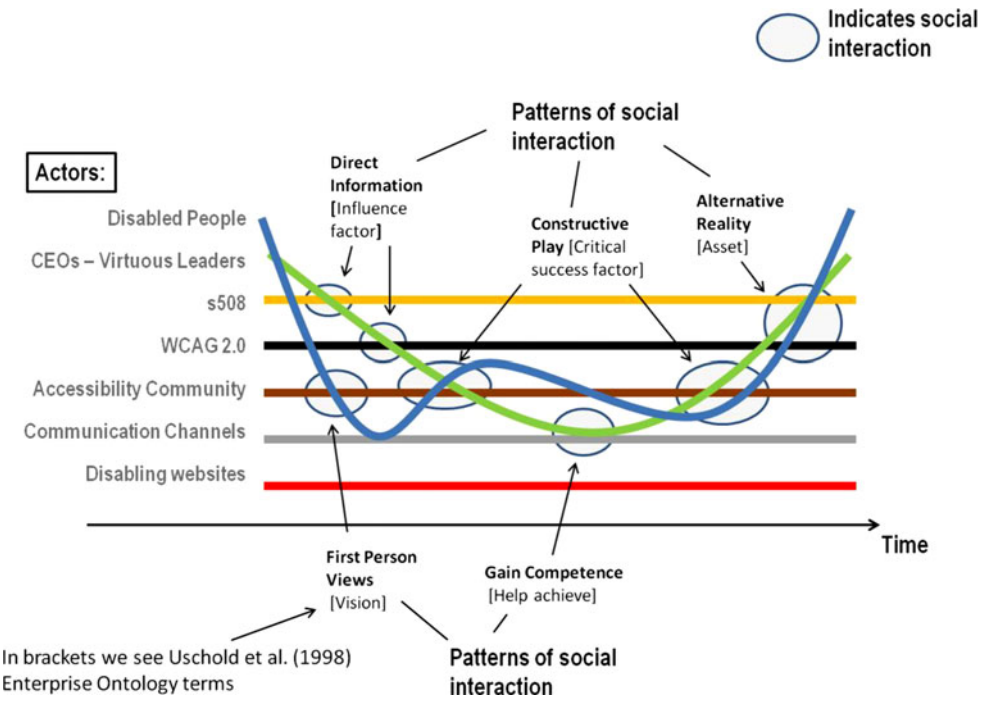

Fig. 10 A BNML storyline view of our vision: moving away from impairments and towards a greater participation in society by all

Views, by disabled people, to the accessibility community. Figure 10 shows how disabled people (represented by the wavy line coming from the top left hand corner of the figure) can be very active, if society does not impair them—disabled people need to keep in close contact with the accessibility community as well as with other Actors, communicating their evolving needs (for example, just as WCAG 1.0 was superseded by WCAG 2.0 we expect that WCAG 2.0 will also have to evolve in the future). The accessibility community will have a big contribution to make in the direction of an Alternative Reality (the last pattern in the figure). The accessibility community is made up of accessibility experts, and this community needs to grow in size. The use of the correct communication channels will be very important for that to happen. There is a crucial intersection where CEOs, the accessibility community and people with impairments will have to meet if we are to be able to solve the global website accessibility problem. This intersection is made evident by the two grey clouds indicating Constructive Play—a pattern of social interaction between these three actors—which is a 'critical success factor' (Uschold et al. 1998). Furthermore, the proper communication channels will help CEOs become virtuous leaders by helping them Gain Website Accessibility Competence (another crucial pattern at the bottom of Fig. 10).

Conclusions

Based on the study undertaken and described above, we managed to achieve our initial goal which was to deliver indicators on the actual accessibility levels presented by the 250 (or 236 of these as not all could be evaluated by our tool) largest enterprises of the year 2009 according to Forbes.

As the results presented 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 [236] largest enterprises of the year 2009, according to Forbes, are indeed decidedly low according to the W3C WCAG1.0, WCAG2.0 and Section 508 standards because, for the majority, they aren't even conformant with the lower accessibility conformance level.

Unfortunately, in EU Member States, one finds that 'results from nationally available data are not comparable across countries due to variable samples and methods applied' (Cullen et al. 2009). Furthermore, 'in all the countries covered, there is a considerable variation in terms of the types of legislative/regulative approaches that are adopted [including for implementation time-frames] and in the types of websites that are addressed' (Cullen et al. 2009). We consider this to be a serious shortcoming at the European level, and thus greater interoperability between systems and organizations, to make communication seamless (Mertins et al. 2008), for web accessibility purposes, needs to be a focus in future—so as to ensure the effort to make websites accessible to all becomes a more concerted one. By making data across countries comparable, and by taking these data into the public arena, there will naturally exist added pressure for the lagging Member

States to improve their web accessibility levels. Costs might also be saved by doing this: if companies are convinced of the need to make their websites accessible from the start then retrofitting accessibility into websites, generally seen to be more expensive, would be avoided. If the web accessibility topic persists as a permanent drive, then both investment efficiency and accessibility compliance will be maximized.

In "An Analysis of Research Results Using the Business Narrative Modelling Language" section, we provided an analysis using the BNML based on a focus-group interaction that we organized (Gonçalves et al. 2011). BNML is a visual tool which seeks to reach other audiences, namely practitioners, outside the academic arena. In using BNML, we provided a road map indicating the way forward towards a more solid foundation for enterprise web accessibility levels to be met in the future. A number of actors will have to be involved—from accessibility experts, corporate financial professionals, website construction/correction tool providers, legislators, website builders, website auditors, to designated communication professionals. Both an accessibility culture and an accessibility community are to be major assets in the worldwide effort to improve enterprise accessibility levels (Fig. 7). Figures 8, 9, and 10, in "Our Vision of the Way Forward: Moving Away from Impairments and Towards a Greater Participation in Society by All" section, represent another BNML effort applied herein to convey our vision of the way forward to future desired website accessibility levels. Disabled people will have an active role to play in this process, as can be seen in Figs. 8, 9 and 10 (disabled people are represented by the wavy line moving up and down and coming from the top left hand corner of the figures—the wavy trajectory indicating mobility).

If what authors Dierendonck and Patterson (2010, p. 3) state is true, that 'what accounts for good leadership has changed dramatically. The ideal of a heroic, hierarchical-oriented leader with primacy to shareholders has quickly been replaced by a view on leadership that gives priority to stewardship, ethical behaviour and collaboration through connecting to other people' even so there is still much ground to be covered, as concerns the stance of enterprises towards disabled people in particular. A major contribution of our article is, as our web accessibility results indicate, that an even louder call is needed for virtuous leadership, from various essential global actors, so that followers will not be ignored, but rather embraced, 'as whole individuals… [in] a more caring society' (Dierendonck and Patterson 2010, p. 3).

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