

Digital Inclusion: Accessibility of websites and mobile applications

Luísa Orvalho

Professor Coordinator and Research at CITECA- ISTECE Porto - luisa.orvalho@my.istec.pt

Researcher at CEDH - Portuguese Catholic University - lorvalho@ucp.pt

Carlos Couto

Assistant Professor at ISTECE Porto

Specialist in Computer Sciences, Researcher at CITECA|ISTECE Porto

carlos.couto@my.istec.pt

Diogo Faria

3rd year Student of the degree in Multimedia

Engineering – ISTECE Porto

diogo.faria.11009@my.istec.pt

Diogo Dias

3rd year Student of the degree in Multimedia

Engineering- ISTECE Porto

diogo.dias.70042@my.istec.pt

Abstract: *This scientific article analyzes the state of the art on web accessibility and highlights users with disabilities or impairments, taking into account usability and user experience. It presents the four pillars related to accessibility on the web, some practical suggestions to be taken into account for the design and construction of websites and also refers to the competent entity for the development of actions to monitor compliance with the legislation. As a reference example of good digital inclusion practice, the Apple website (<https://www.apple.com/pt/>) is analyzed, which allows access to people with some type of disability.*

Keywords: *Web Accessibility Requirements, Usability and User Experience, Tools to support digital accessibility and usability, Web Accessibility Tips, APPLE case study of digital inclusion*

I. Introduction

We are in a digital age, in which we are increasingly present on the Web, through online resources whether in a personal, professional or academic context.

Due to this demand, one ends up gaining web skills, which makes there a greater concern for the involvement of most people, regardless of their type of limitation or cognitive deficit.

It should be noted that this attempt to make it possible for all types of people to be involved in the world of the Web is required by national regulations on equal human rights.

It is estimated that about 15% of the world population has some kind of deficiency or disability, who cannot acquire contents online, nor make any type of transaction or purchase [1]. The creation of more accessible content demonstrates intropathy for this segment of the population, and consequently causes a greater volume of income

to circulate among us and opens the possibility for them to be more immersed in the world that the rest of the population normally has access to. This is something that companies should take into account, because if they don't they will be losing a part of the population in their business offer, due to the fact that they are not properly adapted for them.

It is up to the people whose main function is to create digital content to pay attention and look for strategies that reduce the difficulties of access and understanding of the contents for users with visual and motor difficulties, etc.

II. Web Accessibility

Web Accessibility is based on the principles and techniques to be observed when designing, building, maintaining and updating websites and mobile applications in order to make their content more accessible to users, especially people with some kind of disability.

Denote, that an accessible website allows people with disabilities to interact by means of tools, which allow the conversion of text into speech of online content. But if a website does not meet the accessibility criteria, these technologies will find it difficult to read the content offered online [2].

Web accessibility is important because it ensures that people with disabilities can access and use content online without any barriers. A lack of accessibility can bar people with disabilities from participating in online activities, which can lead to exclusion and discrimination. By making websites more accessible, we can ensure that everyone has equal opportunities to access information, communicate and participate in all kinds of activities.

The evolution towards a digital society is providing users with new ways of accessing information and services, and service providers, such as public sector bodies, are increasingly relying on the internet to produce, collate and make available a wide range of information and services electronically, which are essential to the citizen [3].

An association can be made between accessibility as a whole and accessibility on the web, due to the fact that it is characterised as the characteristic of an environment, equipment, product, object, or service that makes it possible to guarantee a wide variety of users an equal chance of use, in a friendly manner, without there being a major deterioration in the websites themselves.

With the expansion of digital production in recent years, there is undoubtedly a greater willingness to open access to Information and Communication Technologies (ICT) for people with disabilities. This will allow more and more people to have the chance to be more autonomous, to be included and to have a more active social participation.

III. Usability and User Experience

When talking about Web Accessibility, one must make a connection regarding user experience. Briefly, user experience is the overall experience of a person using a product, system or service. It includes the practical, experiential, affective, meaningful and valuable aspects of human-computer interaction and product ownership.

Usability refers to the ease with which visitors can interact with a website.

We approach these two concepts because they are very important in design and development. Although they complement each other they have some differences, namely:

- User Experience is more focused on emotion and perception while usability is mainly focused on action and behaviour.
- User Experience tries to create a connection, an emotional awakening between the user and their product/service, while Usability tries to make it easier for the user to achieve their goal.
- User Experience is concerned with the path you take while on a website or mobile application. Usability, on the other hand, is about how easy it is for the user

to perform a specific task or achieve a specific goal with a product or service.

The better the User Experience, the easier it will be for you to find what you want, so the probability of a greater volume of people entering a site will be much greater, as they will feel immersed in the process itself, and this is very important. Note that there are ten principles that must be taken into account when you want to test the user experience. That are called Nielsen's Heuristics, which are hypotheses that need to be validated to ensure that the design will meet the needs and expectations of the project [4].

IV. Decree-Law N° 83/2018 of October 19

This Decree-Law transposes into national law Directive (EU) 2016/2102 of the European Parliament and of the Council of 26 October 2016 on the accessibility of the websites and mobile applications of public sector bodies.

This requirement is intended to prevent barriers to individuals with limited abilities, whether visual or auditory. Remember that this only applies to websites of public organisations or companies, including public or publicly funded private higher education institutions.

In this decree law the requirements necessary to carry out a project according to Chapter II of Article 5 of the current law are presented. These requirements are aligned with the information provided in Chapter V, but here it is explained in terms of the law. The aim is to ensure that the website meets the criteria of quality, security and legality required by the legislation. These are part of the Accessibility Statement, which indicates that public bodies need to have and comply with the accessibility requirements present in this law. This can include an Accessibility Statement, accessibility policies and feedback mechanisms for users.

- A. "Perceptibility, presenting the information and components of the user interface to users in a way that they can perceive them."
- B. "Operability, ensuring that components and user interface navigation are actionable."
- C. "Understandability, ensuring that the information and operation of the user interface is easy to understand"
- D. "Robustness, presenting content that is robust enough to be reliably interpreted by a wide range of user agents, including assistive technologies."

The next point, point number 2, requires that d) is fulfilled in a way that can facilitate access by users with disabilities, allowing reading and writing not to be solely dependent on sight or hearing.

This article refers to the Accessibility Statement, inserted in Article 8, which states that the entities incorporated in Article 2 must have a detailed accessibility statement, in accordance with the accessibility requirements of the decree-law, which must follow the model approved by the Agency for Administrative Modernization, I. P. (AMA, I. P.). (AMA, I. P.), in which it must include.

Reasons for which some parts are not accessible and their reasons for this lack of accessibility.

- "A description of and link to the mechanism for notification and request for additional information as provided for in Article 12 and the mechanism for lodging a complaint as provided for in Article 13"
- This statement should be present on the website on a page with the address ending in "/accessibility", it should be hyperlinked on the home page and wherever possible in the footer of all pages [8].

- Reasons why some parts are not accessible and their reasons for this lack of accessibility.
- "A description of and link to the mechanism for notification and request for additional information provided for in Article 12 and the mechanism for lodging a complaint provided for in Article 13"

V. Web Accessibility Pillars

The Pillars of Accessibility are the fundamental principles that guide the creation of accessible products, services, environments and technologies for all people, regardless of their abilities or limitations [7].

The W3C is the organisation responsible for the standardisation of the internet, namely regarding the creation and interpretation of contents developed for the web. [5]. In addition, there is a kind of guide where the principles that we must take into account when publishing any content on the web are inserted. This is called Web Content Accessibility (WCAG).

The information in digital mode, should be present in the following ways:

- **Perceptible:** all information and its functionalities must not be invisible or not accessible to all individuals
- **Operable:** the website should be properly functional regardless of how or where it is being accessed.
- **Understandable:** in this pillar, the main focus is on the content being universally understood by users. It has to have links as you find out about the website itself.
- **Robust:** this pillar focuses on all content being demonstrable regardless of the browser and technology that has been used to develop it.

VI. Best Practices for Making the Web More Accessible

When developing content for websites one must take into account several precautions, namely colours, text alignment, good use of HTML (Hypertext Markup Language), CSS (Cascading Style Sheets) and JavaScript, images, among others.

Regarding the care that should be taken, several "tips" can be used such as:

- Add appropriate alternative text to images. This tip is very important when the image for some reason does not appear on the website and it gives you an idea of what kind of content should appear. It also helps people who are blind and use reading devices and Braille.
- Do not deactivate the zoom. Not doing so will help people with low vision to better view the content itself.
- Use titles correctly. Do not jump from h1 to h4 and then back to h1. If used correctly, it will help visually impaired users to understand the structure and consequently the organisation of this.
- Add labels to form fields. This way screen reader users will know which labels or prompts are associated with which form fields.
- Join related form fields. For example, join checkboxes and radio buttons, to a fieldset element. This will make it easier to divide the form itself.
- Identification of the language used on the website.
- Check that the background you are using makes a good contrast with the colour you have chosen for the text.
- Never transmit information only through colours. Colours have meaning, but not everyone associates colours with the same thing and not everyone can see them, so they are a secondary channel of communication.

- Avoid using text in justified mode, as it makes reading difficult, especially in large quantities.
- There is considerable spacing between sections so that the content itself stands out.
- Incorporate in the website, a link that allows users to go to the home page or content, facilitating navigation.
- The underlining of links is very important for users who have difficulty discerning contrast (colour blind). And, if possible with a description of what is going to be achieved through that action.
- Provide a visible indication of focus. Through CSS, use: hover, to have a response to mouse movements. If you're not using mouse, it also does the same effect through: focus.
- Describe the video. This tip should be applied when the user cannot visualize the video. To counteract this, you should create a script where you detail what you want to convey to the user. If the user is deaf-mute, a transcription should be made.
- Use ARIA (Accessible Rich Internet Applications) reference points. This tip is very important, because you only need to add an HTML attribute for one of the eight reference functions and that way, users will be able to jump directly to that section of the website with just a keystroke.
- Creation of widgets in JavaScript that support accessibility. Using this language, it is possible to operate a widget only with the keyboard.
- If you do not want to create widgets with JavaScript, you should use them anyway. To do this you should check the online documentation on Accessibility.
- If you are an online content manager or web developer, keep in touch with the documentation and discuss in forums questions or share work you are doing.

VII. Accessibility Tools

There are several tools capable of helping in the accessibility testing of a website, to check if any of the previous requirements are present. These are important to adapt websites and mobile applications so that the greatest number of users can access the content published on the web. We have several applications such as:

1. **WAVE (Web Accessibility Evaluation Tool)**- this tool is free and allows you to obtain detailed reports with indications of errors and suggested improvements [9].
2. **Axe** - unlike WAVE is an accessibility testing library that can be integrated into automated development and testing workflows [10].
3. **Color Contrast Analyzer**- this tool helps you check the compliance of the colour combinations used on a website with the contrast standards defined by the accessibility guidelines [11].
4. **VoiceOver** (IOS) and **TalkBack** (Android) - these allow you to simulate the experience of a visually impaired user, allowing you to test the accessibility of your app in relation to voice navigation.
5. **Keyboard Accessibility Test** - this helps to test the accessibility for people with motor difficulties, it is possible to test if all the functionalities and elements of the site can be accessed and used only by the keyboard.

VIII. Accessibility in Microsoft Edge

Microsoft Edge is a browser that focuses on the inclusion of users who have some kind of disability [12]. That's why they create products, which can facilitate to them, an access to contents properly well done. There are some features of this browser that deserve to be highlighted, namely:

- **Page Colours** – this feature allows you to change the colour that is present in your Microsoft Edge. This makes it much easier for people who have difficulty distinguishing certain content due to the colours that are being used.
- **Live captures** – analyse the audio taking place in Microsoft Edge, transcribe that speech to text and display the subtitles in a separate window. Note that you can edit the layout of the subtitles appearing on the screen.
- **Immediate Answers** - through this feature it is possible to ask questions and get immediate feedback. In this case, it is very useful for blind users.
- **Automatic image description** – automatically generates descriptions (alt attribute, which is associated with the image element), for users who have difficulty reading the screen. This functionality is carried out with the support of Artificial Intelligence.

IX. Analysis of a case study

As an example of good digital inclusion practice (good accessibility practice) the APPLE website is analyzed as a reference (<https://www.apple.com/pt/>), which allows access to people with some type of disability

Analysing the website with the WAVE tool, it turns out to have excellent accessibility standards, particularly in terms of hierarchical structural markup of HTML elements such as headers and various sections. Regarding the graphic part of the site, it can be seen that the contrast is done successfully and the user is able to follow a line of thought to reach the objective of the page's content.

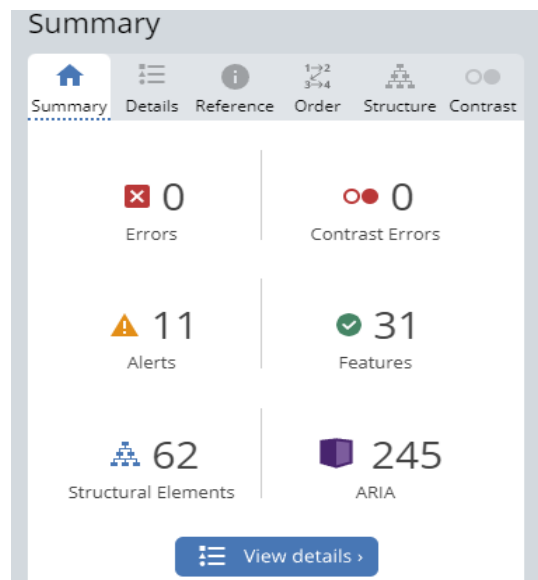
With regard to the alternative description of the images, all are well placed, which favors blind users to obtain the necessary information about the pages, even if they are not present due to

loading problems, the alternative text and audio as attributes describe well the pictures.

For users with motor disabilities, there is the possibility of using only the keyboard through alt and enter to navigate through the pages.

For users with motor disability, there is the possibility of using only the keyboard through alt and enter to navigate the pages. In summary, it can be concluded that this website successfully passes this specific test, as shown in Figure 1.

Figure 1: Apple - WAVE Web Accessibility



Fonte: Evaluation WAVE Tool

X. Discussion

As possible improvements to make this website even more accessible, it is recommended to use a more prominent font size and to avoid redundant links going to the same page.

In a careful analysis of the Apple website, no other problems were detected besides these, and it can be concluded that the website is accessible to a large percentage of users, which benefits its digital inclusion in the product.

XI. Conclusion

The implementation of web accessibility is crucial to ensure the inclusion of all citizens, including people with some type of disability or impairment, to web content. Accessibility assessment tools, checklists, and web standards are crucial to implementing web accessibility. People working in content creation and web development should not only use these tools and techniques to ensure that their website is accessible to all users, as they are easy to implement and demonstrate effective results in solving problems, as well as also assume the commitment to take all appropriate measures to ensure that people with disabilities can access it on an equal basis with others.

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