

Web accessibility and CMS. Moodle as case study

Accesibilidad web y CMS. Moodle como caso de estudio

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ABSTRACT. The advance of ICT can be appreciated in a range of synchronous and asynchronous tools for communication that facilitate the interaction without spatio-temporal restrictions. The Web Accessibility Initiative defines guidelines to let people with disabilities access ICT. The article presents the method and the results obtained from web accessibility evaluation applied to Moodle CMS, using guidelines WCAG 2.0. The results of this study provided data to guide further research and development focused on test processes on web accessibility using specific tools, in order to improved user's experience.

RESUMEN. El avance de las TIC se puede apreciar en una gama de herramientas de comunicación sincrónicas y asincrónicas que facilitan la interacción sin restricciones espacio-temporales. La Iniciativa de Accesibilidad Web define pautas para que las personas con discapacidad accedan a las TIC. El artículo presenta el método y los resultados obtenidos de la evaluación de la accesibilidad web aplicada al CMS Moodle, utilizando las directrices WCAG 2.0. Los resultados de este estudio proporcionaron datos para guiar futuras investigaciones y desarrollos centrados en procesos de prueba de accesibilidad web utilizando herramientas específicas, con el fin de mejorar la experiencia del usuario.

KEYWORDS: WCAG 2.0 guidelines, W3C, Web engineering, Web quality, tools.

PALABRAS CLAVE: Directrices WCAG 2.0, W3C, Ingeniería web, Calidad web, Herramientas.

1. Introduction

International organizations deal with Web Accessibility (WA). Among them, some actions are carried out by the W3C (ISO, 2012; ISO, 2008a; ISO, 2008b; ISO, 2008c; ISO, 2022; W3C, 2022), the Sidar Foundation (2022), the Center for Research and Development of Typhoelectric Adaptations (CIDAT), promoted by ONCE (2022). Web Accessibility is understood as the possibility to people with disabilities can use the Web.

In Mariño et al. (2016), Mariño, Alfonso & Gómez Codutti (2018), Mariño & Alfonso (2018), a comparative study of three open-source Learning Content Management Systems, i.e. Moodle, Joomla, and Droopal, were presented.

HCI community has acknowledged the importance of these non-instrumental aspects, several works have focused on defining and setting the scope of UX (Aizpurua, Harper & Vigo, 2016; Rush & EOWG Participants, 2016). One aspect in order to ensure a good UX is centered on AW. Also, AW could be tried as a software engineering's quality aspect so, it is relevant the method applied.

It is recognized that "the most part of the responsibility for Web accessibility falls upon Web developers, who need to apply the recommended techniques during implementation and maintenance processes (González Crespo, Espada & Burgos, 2016). In Mariño & Alfonso (2017) was exposed results derived from "formal training programs oriented to software developers to create awareness including the AW good practice in the construction of web products" (p. 21). So, it is useful apply automatic and manual validations in order to perform web sites, and contributes to good users' experiences.

In ETSI (2022) in describes Human Factors as a the scientific application of knowledge oriented to tried "the capacities and limitations of users with the aim of making products, systems, services and environments safe, efficient and easy to use". According to Conger, Krauss & Simuja (2015) technologies need to be selected carefully and all supporting technology needs to be installed and ready for use.

Web Accessibility means that disable people can have access and use the Web. It was designed to benefit all e-citizens, encompasses all disabilities which affect access to the Web, including visual, auditory, physical, speech, cognitive, and neurological disabilities, as well as changing disabilities which affect elder people due to aging (WAI, 2022).

Quality assurance (QA) is any systematic process of determining whether a product or service meets specified requirements. Gillis (2019) sustains about the ISO (International Organization for Standardization) is a driving force behind QA practices and mapping the processes used to implement QA. QA is often paired with the ISO 9000 international standard". This paper proposes the Web accessibility as a measure to Quality assurance.

One of the knowledge areas of Software Engineering deals with software quality. Software quality involves different dimensions, one of them being Web Accessibility.

2. Literature review

In an experimental Software Engineering context, this article provides empirical knowledge that supports the need to spread the application of Web Accessibility standards in the design, development and production of digital environments. The findings described in this article are complemented by those published in previous works such as those specified in Mariño & Alfonso (2019a), Mariño & Alfonso (2019b), Mariño, Alfonso & Godoy (2020), Mariño et al. (2021), Mariño & Alfonso (2022) given that the Web Accessibility analysis method is replicated, with the aim of contributing to a more inclusive society.

The current work is part of a research focuses on the investigation of methods and tools to evaluate quality



systems, being the main issue the web accessibility. In other words, the application of standards in the design and development of web sites is a way to address innovative technological projects for its scalability, putting the emphasis on evaluating Moodle (Moodle, 2022) a Content Management System or CMS, a free software platform to facilitate building websites. Moodle is widely used for the development of online courses, as shown in Gamage, Ayres & Behrend (2022), Florjančič & Wiechetek (2022).

“Free software” means software that respects users' freedom and community. Roughly, it means that the users have the freedom to run, copy, distribute, study, change and improve the software. A program is free software if the program's users have the four essential freedoms GNU (GNU, 2021; Ramirez, Reyes, Gil & Durgam, 2015):

- The freedoms to run the program, for any purpose (freedom 0).
- The freedom to study how the program works and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
- The freedom to redistribute copies so you can help your neighbor (freedom 2).
- The freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.

3. Methodology

According to Mariño et al. (2014), Mariño, Alfonso, Gómez Codutti & Godoy (2015) the method consists on the following stages:

- Stage 1. Projects developed by other areas of the country and the studies mentioned were surveyed Mariño et al. (2015).
- Stage 2. The theoretical framework referred to the subject was studied in deep, using documents and tools provided by the W3C as data sources.
- Stage 3. Web pages based on Moodle (2022) such as CMS were selected.
- Stage 4. Criteria established by the WCAG 2.0 guidelines WCAG (2008) were defined, using Google Chrome as browser.
- Stage 5. TAW (2022) -an automatic validator or a software program that can check the web pages against the web standards- was selected. It was applied to three pages that make up the website of an educational platform based on free software such as Moodle (2022). For privacy reasons, the analyzed site name is not specified.
- Stage 6. Systematization and analysis of data. The results provided by the automatic validator were systematized, in order to analyze the current art state of the application of accessibility, and propose and elaborate further studies from the obtained results.

4. Results

During this study, the Moodle web site´s pages of an Universities was analyzed for accessibility using WCAG (2008). The evaluation was done using TAW (2022).

The guidelines and success criteria are organized around the following four principles are described in W3C (2016).

This section describes the results obtained from the WCAG (2008) guidelines application in order to validate the pages web of the site selected. The W3C collect a set of Barriers Common that is focused in four different contexts: Perceivable, Operable, Understandable, and Robust (WCAG, 2008). The principles and guidelines used were the ones described below: This section synthetizes the results obtained considering the WCAG 2.0 guidelines:

A. Perceivable - Information and user interface components must be presentable to users in ways they can perceive:

- I. Text Alternatives: Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language;
- II. Time-based Media: Provide alternatives for time-based media;
- III. Adaptable: Create content that can be presented in different ways (for example simpler layout) without losing information or structure;
- IV. Distinguishable: Make it easier for users to see and hear content including separating foreground from background.

B. Operable: User interface components and navigation must be operable:

- I. Keyboard Accessible: Make all functionality available from a keyboard;
- II. Enough Time: Provide users enough time to read and use content;
- III. Seizures: Do not design content in a way that is known to cause seizures;
- IV. Navigable: Provide ways to help users navigate, find content, and determine where they are.

C. Understandable - Information and the operation of user interface must be understandable:

- I. Readable: Make text content readable and understandable;
- II. Predictable: Make Web pages appear and operate in predictable ways;
- III. Input Assistance: Help users avoid and correct mistakes.

D. Robust - Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies:

- I. Compatible: Maximize compatibility with current and future user agents, including assistive technologies.

According to WCAG criteria, some websites may require a greater level of accessibility than others; so WCAG proposes three different accessibility levels from lowest to highest Aizpurua, Harper & Vigo(2016), González Crespo, Espada & Burgos (2016).

- Level A (lowest): The web page satisfies all the Level A Success Criteria, or conformance to an alternate version is provided.
- Level AA (medium): The web page satisfies all the Level A and Level AA Success Criteria, or a Level AA alternate version is provided.
- Level AAA (highest): The web page satisfies all the Level A, Level AA and Level AAA Success Criteria, or a Level AAA alternate version is provided.

From this study, checklists of accessibility guidelines have been applied to the pages of an educational platform developed in Moodle order to evaluate the accessibility, being these are the initial course page, the cursor page and the activity development page. Figure 1 shows the results obtained through the implementation of the WCAG 2.0 guidelines and indicates the existence of automatic problems detected by the TAW tool TAW (2022), grouped by principles; and to which corrections must be made.

Of the pages analyzed, the “initial course” page indicates the existence of problems in 52.63% for the Operable principle, 26,32% for the Perceptible principle; and to a lesser extent for the Robust principle (15,79%) and the Understandable (5,26%). Regarding the “course page” and the “activity development page”, similar percentages of problems that must be corrected are observed.

Figures 2, 3 y 4 present the possible problems detected by the tool that must be verified manually, grouped into “warnings” (it is necessary to manually review) and “Not verified” (completely manual check).

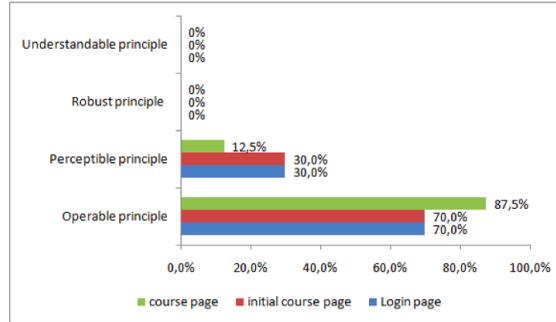


Figure 1. Evaluation of the selected pages applying WCAG 2.0 guidelines. Source: Self-made.

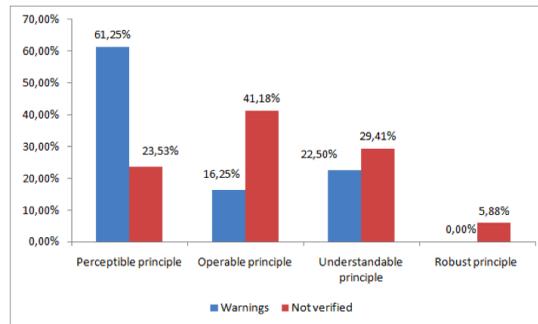


Figure 2. Review of “initial course” page principles. Source: Self-made.

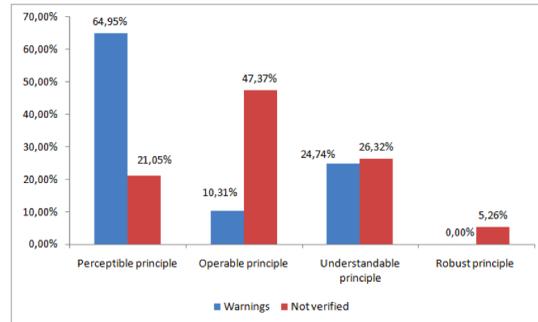


Figure 3. Review of “course page” page principles. Source: Self-made.

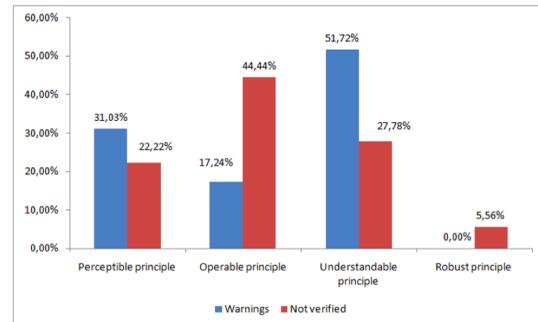


Figure 4. Review of “login page” page principles. Source: Self-made.

5. Conclusions

The Software Industry faces a constant evolution. Even so, there are certain aspects such as the quality of the software product that require permanent work given its close relationship with the user experience.

This paper focused to evaluate Moodle accessibility; a CMS widely used in the free software development community. As mentioned in previous studies, it is evident that the measurement of accessibility web in technology products as CMS is a topic of current interest and relevance, considering the validity of these regulations to promote a better quality of technologies for human's use.

This study provided data to guide further research and development focused on test processes on web accessibility using specific tools, in order to improved user's experience.

Also, in order to contribute to the Software Industry with computer systems oriented to all e-citizens we will proceed to apply corrective maintenance focused on accessibility. The results will be disseminated in the software development community.

Considering the importance related to social and formative responsibility assumed from the University, the training of human resources on issues related to software quality. Specifically focalized to Web Accessibility will continue. So, these standards, methods and tools included in Software Engineering contribute to the construction of artefacts incorporated into an inclusive knowledge society.

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