Automatic Evaluation of WCAG 2.0 Guidelines in a Drupal-based Platform

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Abstract

Web accessibility has become a main concern that has motivated interest all over the world. The Web Accessibility Initiative (WAI) defines guidelines to let people with disabilities access ICT. This article presents the web accessibility evaluation applied to Drupal CMS, using guidelines WCAG 2.0, and an automatic validator.

Keywords: WAI; WCAG 2.0 Guidelines; Evaluation; W3C; Web Engineering; Web Quality.

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1. Introduction

Nowadays, in societies where knowledge has become a relevant topic, many agencies around the world such as Sidar Foundation [1], World Wide Web Consortium, International Organization for Standardization among others, have focused on determining how technology, and Information and Communication Technologies (ICT) benefit and help humans improve their life quality.

Because of this reason, Web Accessibility has turned into a common issue for global organizations. In recent years, many actions have been taken to promote and enact legislation on this matter; World Wide Web Consortium (W3C) [2], through the Web Accessibility Initiative [3], is a good example of this. Its aim is to define guidelines and facilitate the access to the web content to those who suffer from any kind of disability.

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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 [4].

Web Accessibility is a quality criterion in Software Engineering (SE), where there is a variety of methods and tools prepared to be used in the design and developmental processes. Therefore, international standards to design, develop and evaluate the quality of a Web software product should be taken into account. This means that software construction cannot be exempt from the application of the quality criteria, being accessibility one of them.


Web Content Accessibility Guidelines (WCAG) 2.0, cover a wide range of recommendations to make Web content more accessible. Following these guidelines, a wider range of people with disabilities like blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech disabilities, photo-sensitivity and combinations of these (ISO/IEC 40500:2012) [6], are able to access information.

With the purpose of contributing to the inclusion of disable people with permanent or temporary incapacities, who access the Internet either to use it or to disseminate knowledge, the application of guidelines must be proposed. These are set up by organizations that regulate the WWW, and are used to raise awareness among software developers and companies, of the necessity to create accessible sites for more people and functionalities from any Internet-connected devices.

There is a great variety of work that address the subject and measure the accessibility in different fields such as those exposed in [7] [8] [9] [10] [11] [12] [13] [14] [15] [16]. Educational platforms have had a long and evolutionary development. For teachers, it has become an unavoidable challenge since they have had to learn how to use them, in order to implement innovative strategies to support the teaching-learning process in which the student becomes the focus of learning. In addition, the advance of ICT can be appreciated in a range of synchronous and asynchronous tools for communication that facilitate the interaction between teachers and students without spatiotemporal restrictions.

The current work is part of a research which focuses on the investigation of methods and tools to evaluate quality systems, being the main issue the 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 Drupal [17], a Content Management System or CMS, a free software platform to facilitate the implementation of web sites. It is important to mention the background of the team responsible for this work: [18] [19] [20] [21] [22].
2. Method

The applied method followed the stages below:

• **Stage 1.** Projects developed by other areas of the country and the studies mentioned by [6] [21] were surveyed.

• **Stage 2.** The theoretical framework referred to the subject was studied in depth, using documents and tools provided by the W3C as data sources.

• **Stage 3.** Web sites based on Drupal [17] such as CMS were selected.

• **Stage 4.** Criteria established by the WCAG 2.0 guidelines [23] were defined, using Google Chrome as browser. The hardware configuration used was: Intel (R) Pentium (R) CPU 2020M@2.40 GHz, 4.00 GB RAM, System Type: 64-bit operating system.

• **Stage 5.** TAW [24] was selected since it is an automatic validator available on the web. The validating tool was applied to the web site selected.

• **Stage 6.** Systematization and analysis of data. The results provided by the automatic validator was systematized, in order to analyze the current art state of the application of accessibility, and propose and elaborate further studies from the obtained results.

3. Results

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

   - 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;
   - Time-based Media: Provide alternatives for time-based media;
   - Adaptable: Create content that can be presented in different ways (for example simpler layout) without losing information or structure;
   - 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:**

   - Keyboard Accessible: Make all functionality available from a keyboard;
   - Enough Time: Provide users enough time to read and use content;
   - Seizures: Do not design content in a way that is known to cause seizures;
   - 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:**

   - Readable: Make text content readable and understandable;
   - Predictable: Make Web pages appear and operate in predictable ways;
   - 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:**
• Compatible: Maximize compatibility with current and future user agents, including assistive technologies.

Table 1 shows the results obtained through the implementation of the WCAG 2.0 guidelines. To describe them at each checkpoint, the following references are used in the columns: YES (Verifies the fulfilment of the criterion evaluated), NO (The criterion was not fulfilled), N / A (Not applicable to the tool selected), I / R (Unable to perform an automatic evaluation), RRM (Requires manual revision).

The analysis of the results of accessibility evaluation, provides the following information:

• For the first principle, Perceptible (Figure 1), 60% of the guidelines do not apply, 30% of them are impossible to perform an automatic test and the remaining 10% indicates that no problems are found.

• For the second principle, Operable (Figure 1), 77.78% of the guidelines are not able to perform the automatic validation, 11.11% of them cannot be applied using the selected tool and the remaining 11.11% require manual revision.

• As regards the third principle, Understandable (Figure 2), 40% of the guidelines do not apply, 40% are also impossible to perform an automatic test and the remaining 20% indicates the existence of problems.

• For the principle Robust (Figure 2), 50% of the evaluated guidelines do not have problems; while in the remaining 50%, an automatic verification cannot be performed.

**Table 1.** Evaluation of the selected site applying WCAG 2.0 guidelines

<table>
<thead>
<tr>
<th>Guidelines</th>
<th>YES</th>
<th>NO</th>
<th>N/A</th>
<th>I/R</th>
<th>RRM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guideline 1.1 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.</td>
<td>1.1.1 Non-text Content</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guideline 1.2 Time-based Media.</td>
<td>1.2.1 Audio-only and Video-only (Prerecorded)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2.2 Captions (Prerecorded)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>1.2.3 Audio Description or Media Alternative (Prerecorded)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guidelines</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
<td>I/R</td>
<td>RRM</td>
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</tr>
<tr>
<td>Guideline 1.3 Adaptable: Create content that can be presented in different ways (for example simpler layout) without losing information or Structure.</td>
<td>1.3.1 Info and Relationships</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>1.3.2 Meaningful Sequence</td>
<td></td>
<td></td>
<td>X</td>
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<tr>
<td></td>
<td>1.3.3 Sensory Characteristics</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Guideline 1.4 Distinguishable: Make it easier for users to see and hear content including separating foreground from background.</td>
<td>1.4.1 Use of Color</td>
<td>X</td>
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<tr>
<td></td>
<td>1.4.2 Audio Control</td>
<td></td>
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<td>X</td>
<td></td>
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<tr>
<td></td>
<td>1.4.3 Contrast (Minimum)</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Guideline 2.1 Keyboard Accessible: Make all functionality available from a keyboard.</td>
<td>2.1.1 Keyboard</td>
<td>X</td>
<td></td>
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<tr>
<td></td>
<td>2.1.2 No Keyboard Trap</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Guideline 2.2 Enough Time: Provide users enough time to read and use content.</td>
<td>2.2.1 Timing Adjustable</td>
<td>X</td>
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<tr>
<td></td>
<td>2.2.2 Pause, Stop, Hide</td>
<td></td>
<td></td>
<td>X</td>
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<tr>
<td>Guideline 2.3 Seizures: Do not design content in a way that is known to cause seizures.</td>
<td>2.3.1 Three Flashes or Below Threshold</td>
<td>X</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Guideline 2.4 Navigable: Provide ways to help users navigate, find content, and determine where they are.</td>
<td>2.4.1 Bypass Blocks:</td>
<td>X</td>
<td></td>
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<tr>
<td></td>
<td>2.4.2 Page Titled</td>
<td></td>
<td></td>
<td>X</td>
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<td></td>
<td>2.4.3 Focus Order</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td></td>
<td>2.4.4 Link Purpose (In Context)</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Guideline 3.1 Readable: Make text content readable and understandable.</td>
<td>3.1.1 Language of Page</td>
<td>X</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Guideline 3.2 Predictable: Make Web pages appear and operate in predictable ways.</td>
<td>3.2.1 On Focus</td>
<td>X</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>3.2.2 On Input</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Guideline 3.3 Input Assistance: Help users avoid and correct mistakes.</td>
<td>3.3.1 Error Identification</td>
<td>X</td>
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<td></td>
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<tr>
<td></td>
<td>3.3.2 Labels or Instructions</td>
<td></td>
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<td>X</td>
<td></td>
</tr>
<tr>
<td>Guideline 4.1 Compatible: Maximize compatibility with current and future user agents, including assistive technologies.</td>
<td>4.1.1 Parsing</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.1.2 Name, Role, Value</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Figure 1. Review of Perceivable and Operable principles.

Figure 2. Review of Understandable and Robust principles

4. Conclusions and Future Work

The aim of this work was to evaluate Drupal accessibility, a CMS widely used in the free software community. The systematization and analysis of the data, demonstrate that the overall accessibility guidelines defined by WCAG 2.0 are not contemplated in the design and development of the CMS platform evaluated.

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.

In order to continue with this research, an evaluation of CMS will be carried out so as to delineate aspects to be considered in the customization of content management systems, using the guidelines defined to WCAG 2.0. This evaluation will also contemplate the use of various browsers and devices.
A relevant social and educational task is to promote the implementation of the accessibility W3C guidelines in order to contribute to the Software Industry with computer systems oriented to all e-citizens.

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References


