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Web Accessibility and CMS. A case study about Joomla and Drupal plataforms

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Abstract: Web Accessibility became a common problem that has motivated the interest in all over the world. The Web Accessibility Initiative (WAI) defines the guidelines to facilitate access for people with disabilities to ICT. The 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. The application of standards in the design and development of web sites is a way to defines innovative technological projects oriented to scalability.
This paper discusses the web accessibility evaluating applied to Joomla and Drupal CMS using guidelines WCAG 2.0 and an automatic validator. The assessment and monitoring of CMS accessibility are important in order to guarantee the universal accessibility in Software Engineering. The systematization and analysis of the data, demonstrate that overall accessibility guidelines defined by WCAG 2.0 are not contemplated in the design and development of the CMS platforms evaluated.
Keywords: WCAG 2.0 guidelines, evaluation, W3C, Web Engineering, Web Quality, tools, CMS.

1. Introduction

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.

ETSI (2017) 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 and Simuja (2015, p. 1566) "technologies need to be selected carefully and all supporting technology needs to be installed and ready for use".

In knowledge society, a relevant aspect is to ensure that citizens have access to web information. Accessibility is a major concern in our society nowadays (DíazBossini& Moreno, 2014). Nowadays, in societies where knowledge has become a relevant topic, many agencies around the world such as Sidar Foundation (FS, 2016), 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.

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, 2017).

Quality assurance (QA) is any systematic process of determining whether a product or service meets specified requirements.

Rouse (2018) sostains 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

According to Jeya Mala, Mohan and Kamalapriya (2010), in the software development industry, software testing is one of the most important processes, because it allows one to ensure the quality of software products. WCAG is an ISO/IEC 40500:2012 standard for web content accessibility (Kesswani& Kumar, 2016). Also, Web Content Accessibility Guidelines (WCAG, 2008), 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, 2012), are able to access information.

There is a great variety of works that address the subject and measure the accessibility in different fields such as those exposed in DíazandHarari, 2015; Russo, Sarobe, Esnaola, Alonso, Serrano, Ciccerchia, Belles, Guruceaga, Di Cicco, Belles, Osella Massa, Jaszczyszyn, and Tessore, (2015).

The assessment and monitoring of CMS accessibility are important in order to guarantee of universal accessibility in Software Engineering. As mentioned in Mariño, Alfonzo, Escalante, Alderete, Godoy, and

Primorac (2014)and Mariño, Alfonzo, Gómez Codutti and Godoy (2015), many web sites developed using CMS still fail to provide accessible web content based on W3C.

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 Joomla and Drupal, two content management systems or CMS, both are free software platforms created to facilitate the construction of websites.

"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(2017):

- 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

The free and open-source software includes a set of software products that have in common that they share licenses, include the distribution of the source code and the ability to modify it to suit or better (Ramirez, Reyes, Gil and Durgam 2015).

This paper was based onthe work described in Acevedo, Gómez Solis, Mariño andGodoy (2013); Alfonzo, Mariño, Cavalieri, and Gómez Codutti (2014), Mariño et al. (2014) and Mariño et al. (2015).

2. Method

According to Mariño et al. (2014) and Mariño et al. (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 sites based on Joomla and Drupal 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 an automatic validator or a software program that can check the web pages against the web standards- was selected. It was applied to the main page of the web site selected.
- **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.

3. Results

This section describes the results obtained from the WCAG 2.0 (WCAG, 2008) guidelines application in order to validate the web sites 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 sintetizes the results obtained considering the WCAG2.0guidelines:

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.

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.

The accessibility is widely agreed as an essential requirement for promoting universal access of information (Sánchez Gordón& Moreno, 2014).From this study, checklists of accessibility guidelines have been applied to the main page of web site developed to Joomla in order to evaluate the accessibility. Table 1 shows the results obtained through the implementation of the WCAG 2.0 guidelines. To describe them at eachcheckpoint, the following referencesare used in the columns: YES (Verifies the fulfillment 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).

Table 1: Evaluation of the selected sites applying WCAG 2.0 guidelines

Guidelines		**Joomla CMS**					**Drupal CMS**				
		YES	NO	N/A	I/R	RRM	YES	NO	N/A	I/R	RRM
Guideline 1.1 Text Alternatives	1.1.1 **Non-text Content**		X						X		
Guideline 1.2 Time-based Media.	1.2.1 Audio-only and Video-only (Prerecorded)			X					X		
	1.2.2 Captions (Prerecorded)			X					X		
	1.2.3 Audio Description or Media Alternative (Prerecorded)			X					X		
Guideline 1.3 Adaptable	1.3.1 Info and Relationships		X				X				
	1.3.2 Meaningful Sequence			X					X		
	1.3.3 Sensory Characteristics				X					X	
Guideline 1.4 Distinguishable	1.4.1 Use of Color				X					X	
	1.4.2 Audio Control			X					X		
	1.4.3 Contrast (Minimum)				X					X	
Guideline 2.1 Keyboard Accessible	2.1.1 Keyboard				X					X	
	2.1.2 No Keyboard Trap				X					X	
Guideline 2.2 Enough Time	2.2.1 Timing Adjustable				X					X	
	2.2.2 Pause, Stop, Hide				X					X	

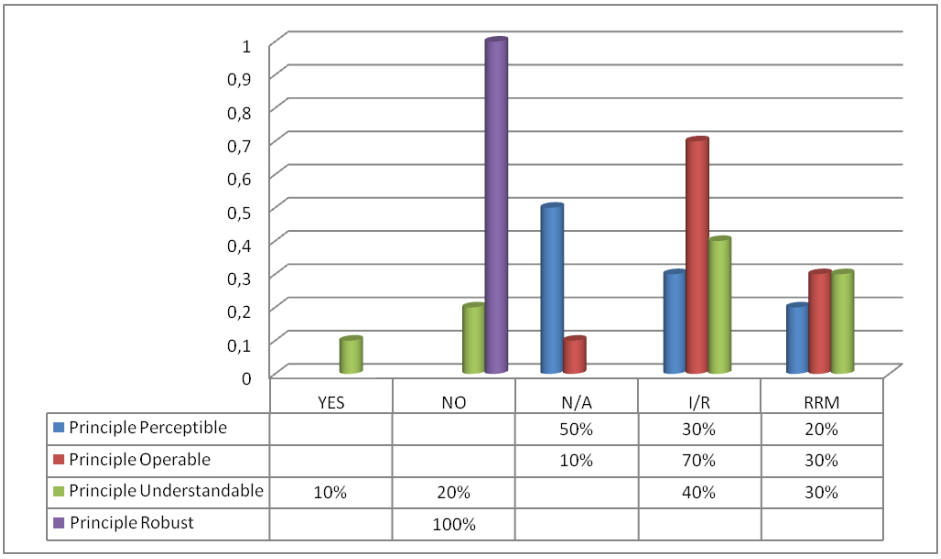
Guidelines		Joomla CMS					Drupal CMS				
		YES	NO	N/A	I/R	RRM	YES	NO	N/A	I/R	RRM
Guideline 2.3 Seizures	2.3.1 Three Flashes or Below Threshold				X					X	
Guideline 2.4 Navigable	2.4.1 Bypass Blocks:					X				X	
	2.4.2 Page Titled					X					X
	2.4.3 Focus Order				X					X	
	2.4.4 Link Purpose (In Context)			X					X		
	2.4.5 Multiple Ways				X						X
Guideline 3.1 Readable	3.1.1 Language of Page	X									
	3.1.2 Language of Parts				X			X			
Guideline 3.2 Predictable	3.2.1 On Focus				X					X	
	3.2.2 On Input		X							X	
	3.2.3 Consistent Navigation				X						
	3.2.4 Consistent Identification				X						
Guideline 3.3 Input Assistance	3.3.1 Error Identification					X			X		
	3.3.2 Labels or Instructions		X						X		
	3.3.3 Error Suggestion					X			X		
	3.3.4 Error Prevention (Legal, Financial, Data)					X					X
Guideline 4.1 Compatible	4.1.1 Parsing		X				X				
	4.1.2 Name, Role, Value		X							X	

The analysis ofthe resultsof accessibility evaluation provides the following information:

i) Web site developed to Joomla (Figure 1)
- Aboutthe first principle, Perceptible, 50% ofthe guidelinesdo not apply, 30% of them areimpossibleto performan automatic testand the remaining 20% indicates the existence ofproblems.
- About thesecond principle, Operable,70% of the guidelines are not able to performthe automatic validation, 10% of them cannot be appliedusing the selected tooland the remaining 20% require manual revision.
- As regards thethird principle, Understandable, 20% ofthe guidelinesdo not apply, 30% require manual revision, 40%arealsoimpossible to perform an automatic test and the remaining 10% indicatesthat noproblems are found.
- Finally,about theprinciple Robust 100% indicates the existence ofproblems.

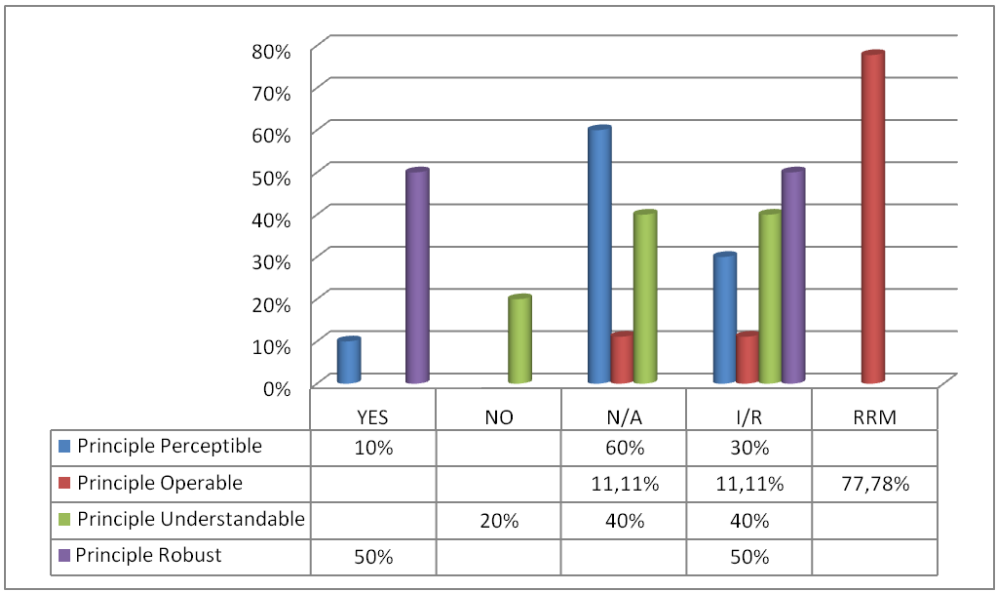
ii) Web site developed to Drupal (Figure 2)
- For the first principle, Perceptible, the 60% of the guidelines do not apply, the 30% were impossible to perform automated testing and the remaining 10% indicated that there were no problems found.

- For the second principle, Operable, in the 77.78% of guidelines are impossible to perform the automatic validation, while 11.11% do not apply using the selected tool and the remaining 11.11% require manual review.
- In reference to the third principle, Understandable, 40% of the guidelines do not apply, 40% are also impossible to perform automated testing and the remaining 20% indicates the existence of problems.
- For the principle Robust, in the 50% of guidelines evaluated have not encountered problems, while for the remaining 50% is impossible to perform automatic verification.



	YES	NO	N/A	I/R	RRM
Principle Perceptible			50%	30%	20%
Principle Operable			10%	70%	30%
Principle Understandable	10%	20%		40%	30%
Principle Robust		100%			

Figure 1. Review for principles applied on Web site developed using Joomla



	YES	NO	N/A	I/R	RRM
Principle Perceptible	10%		60%	30%	
Principle Operable			11,11%	11,11%	77,78%
Principle Understandable		20%	40%	40%	
Principle Robust	50%			50%	

Figure 2. Review for principles applied on Web site developed using Drupal

4. Conclusions and future work

This paper focused on evaluate Joomla and Drupal Web Accessibility, two CMS widely used in the free software development community.

The systematization and analysis of the data, demonstrate that overall accessibility guidelines defined by WCAG 2.0 are not contemplated in the design and development of the CMS platforms evaluated.

This study provided data to guide further research and development focused on test processes on Web Accessibility using specific tools. So, in order to following the indagation presented, the works will continue to

evaluating CMS to delineate aspects to must be consider in customizing of content management systems using the guidelines defined to WCAG 2.0 2.0/WAI. Also, the future evaluations will contemplate the use of various browsers and devices.

As mentioned in previous studies, it is evident that the measurement of Web Accessibility 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.

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.

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