



## Accessibility Evaluation of Peruvian E-Commerce Websites

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### ABSTRACT

Technological growth has caused most companies to provide their products and services through the Internet. This domain forces organizations to offer high-quality web applications that can be accessed by individuals regardless of their abilities and capabilities. In particular, the E-Commerce context in which the competitiveness is high because of the number of web sites that are available on the Web, to offer graphical user interfaces that are accessible can be the deciding factor for business success. The purpose of this research is to evidence the degree of awareness about accessibility in Peru through an assessment of the main Peruvian web sites involved in the E-Commerce domain.

**Key words:** Accessibility assessment, transactional web sites, automated tools, Human-Computer Interaction.

### 1. INTRODUCTION

Accessibility is considered nowadays an important aspect for the development of enterprise software applications [1,2]. To offer systems that can be accessible by the people regardless of their diverse abilities, capabilities and skills is essential. Its relevance is justified in that all people have the same right and opportunities to access information. The United Nations (UN) establishes that the access to communications technologies is a basic human right [3]. In this sense, several standards have been developed to promote the design of interfaces taking into consideration accessibility aspects. Internationally, the W3C Web Accessibility Initiative (WAI) is reference in this matter. The guidelines which are widely recognized and accepted by most of the specialists in the academia and industry have been proposed by the WAI. These directives rely on three different types of components: (1) web content, (2) user agents, and (3) authoring tools. In the same way, given the importance of this quality attribute, the local government of Peru has established a regulation (Ministerial Resolution No. 126-2009-PCM) in which some considerations to develop accessible websites are established. The intention of the Peruvian government is that this document be considered as a normative by all the local entities that provide a website to offer services to the citizens.

The E-Commerce domain is no stranger to the importance that the accessibility is obtaining in the software development process [4,5]. On the contrary, given the significant number of people with different skills and abilities, not contemplating aspects that make a website accessible would be a mistake. In a competitive market such as the current one, in which there are several available options of websites for the purchase and sale of products and services, to provide user-friendly tools and accessible mechanisms can be the differentiating factor to generate competitive advantage. However, these mechanisms that become a website accessible, can only be implemented if the development team or the stakeholders are fully aware that accessibility is an important attribute.

The goal of this research is to evidence through an automated accessibility evaluation of some applications of E-Commerce, the degree of awareness that companies in Peru have about the concept of accessibility in the retail sector.

### 2. ACCESSIBILITY EVALUATION METHODS

In a previous work [6], we performed a systematic review of the literature (SLR) according to the protocol established by Kitchenham [7], to identify the current available methods that can be used to evaluate the accessibility of software products. According to the results, we determined that the methods can be classified in three types:

- **Automated method:** which involves executing a software tool to determine automatically accessibility problems that are present in a particular web site. Generally, these tools are free, are available online, and are recommended by the W3C [8]. These tools are programmed to verify if the website meets all the guidelines of content established in the standard WCAG.
- **Inspection method:** which involves having specialists in the field of Human-Computer Interaction who judge whether the website meets all the guidelines of content established in the standard WCAG. It is important to highlight that although most of the accessibility problems can be identified by a tool in an automated way, there is a small percentage of issues that only can be detected by manual inspection.
- **Test with users:** which involves analyzing the interaction between the software product and potential end users of the system. The purpose of this particular test is to verify whether

the application is in fact accessible for people regardless their abilities, capabilities, and skills. This evaluation is commonly conducted by specialists in HCI who must previously prepare the test and state the user profile according to the accessibility guidelines that they are evaluating.

After a comprehensive analysis of the different methods that can be used for an accessibility evaluation, we determined that there is no better method than the other, and on the contrary, they complement each other. The automated tools are not able to identify all problems related to the guidelines established in the Web Content Accessibility Guidelines (WCAG) 2.1., thus a manual review performed by specialists is always required. Even many of these tools establish and suggest applying the inspection method to complement the results. Likewise, the tests will allow obtaining direct information from real users. Through the conduction of an accessibility test with potential users of the system, it is possible to validate all the findings identified by the automated tools and the specialists. In these controlled case studies, the users can detail the design aspects that make access to the system difficult. This kind of tests can be considered by some authors such as Nielsen [9,10] and Holzinger [11] as fundamental and irreplaceable, given that they provide relevant information about how people feel using the system and what problems they can face. The analysis of the evaluation methods establishes the automated tools as the most used by the academic community for the analysis of the web accessibility. This work evidences the execution of a case study in which the accessibility of websites is evaluated by the usage of a automated tool.

### 3. ACCESSIBILITY EVALUATION PROTOCOL

The W3C Working Group has established a methodology that can be used to carry out accessibility evaluations in the web domain. This protocol is known as the Website Accessibility Conformance Evaluation Methodology (WCAG-EM) and it is currently in version 1.0 [12], and defines five main steps: (1) definition of the scope of the evaluation, (2) exploration of the website, (3) selection of a representative sample, (4) auditing of the selected sample, and (5) report of the evaluation results.

#### 3.1. Definition of the Scope

Defining the scope of the evaluation involves establishing the target websites, the goal of the assessment, and the definition of the WCAG conformance level (A, AA, AAA). The purpose of this study was to evaluate the leading Peruvian e-commerce websites in order to determine the level of awareness that the companies have regarding accessibility. Under this approach, an online review conducted by O. Yabiku [13] about the best online e-commerce stores in Peru, was considered. In Table 1, a list of the selected websites for the accessibility evaluation is presented, based on the top five of the mentioned review. The websites have been evaluated up to level AA, as it is generally

accepted and recommended by the W3C Web Accessibility Initiative (WAI) [14].

**Table 1:** Top 5 of the main e-Commerce websites in Peru

Company	Main URL
Saga Falabella	<a href="https://www.falabella.com.pe/">https://www.falabella.com.pe/</a>
Ripley	<a href="https://www.ripley.com.pe/">https://www.ripley.com.pe/</a>
Linio	<a href="https://www.linio.com.pe/">https://www.linio.com.pe/</a>
Wong	<a href="https://www.wong.pe/">https://www.wong.pe/</a>
Plaza Veá	<a href="https://www.plazavea.com.pe/">https://www.plazavea.com.pe/</a>

#### 3.2. Exploration of the Website

The exploration phase involves identifying crucial web pages for the evaluation as well as associated functionality and types of content. For this case study, the structure of the websites was reviewed, determining that they were mainly composed of home pages, search engines to identify the offered products by these companies, and environments for users to visualize the product description and details.

For this accessibility evaluation, both, the home page and the section in which the search results are retrieved were analyzed by an automated tool. In this phase, the proposed approach (WCAG-EM) also establishes to define the most appropriate accessibility evaluation tool for the target scenario. According to Abascal et al. [14], AChecker is considered one of the most used tools, since it is free to use, it is not required to purchase a license, provide a coverage up to AA conformance level and establishes a classification system of the identified problems. In this sense, AChecker was selected as the evaluation tool to measure the level of accessibility of the Peruvian e-commerce websites.

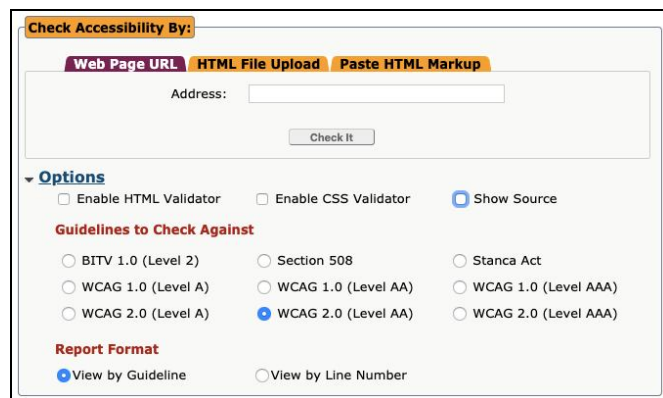
#### 3.3. Selection of a Sample

This phase involves the selection of a representative sample of web pages when the it is not feasible to evaluate all sections of the web application. However, given that in the exploration phase, it was determined that only three sections were going to part of the accessibility evaluation, 100% of the sample was considered. The selected sections were: (1) home page, (2) the page in which the search results are displayed, and (3) a page related to the description of a product is offered in the online e-Commerce web application. The number of companies that was considered for the evaluation is the top five of the leading Peruvian e-commerce websites.

#### 3.4. Accessibility Evaluation

The evaluation was performed with AChecker in concordance with the standard WCAG 2.0 since it is the version supported by the automated tool. The considered conformance level was AA, given that it is most recommended by WAI and is within the scope of most existing tools. The accessibility evaluation was performed by the authors on February 1st, 2020. The tool

provides a link (<https://achecker.ca/checker/index.php>), that is available on Internet, in which the inspector can place the IP address of the web page or the URL to be evaluated. Figure 1 illustrates the graphical user interface provided by AChecker to execute an accessibility assessment. In the interface design, it is also possible to select the standard against which the web site will be verified, and if the report must be displayed by line number or unfulfilled guideline. Besides, the tool provides the option to upload an HTML file or paste HTML code program for review. In this case study, we employed the URL option to conduct the accessibility evaluation. The main URL and the derived addresses of the top five of the leading e-Commerce websites in Peru were considered.



**Figure 1:** AChecker interface for accessibility evaluations

### 3.5. Report of the Results

This phase involves aggregating and reporting the evaluation findings. Table 2 summarizes the results of having performed the accessibility evaluation to the selected websites.

**Table 2:** Number of identified accessibility issues cataloged by conformance level of the top 5 leading e-Commerce websites in Peru

Company	Number of Accessibility Errors		
	Level A	Level AA	TOTAL
Saga Falabella	92	52	<b>144</b>
Ripley	171	15	<b>186</b>
Linio	10	4	<b>14</b>
Wong	102	0	<b>102</b>
Plaza Vea	69	10	<b>79</b>

### 4. ANALYSIS OF THE RESULTS

The results evidence that the leading e-Commerce websites in Peru present a meaningful number of accessibility problems. Although being highly recognized companies in the Peruvian market, these international businesses are not considering the standard to make their websites accessible. None of the sites meet minimum level of compliance established by the W3C. There is no awareness of the importance of developing quality software products. Technology is not considering people with different skills. In Peru, this fact means that 10.4% of the total population is being ignored and unattended [15]. Most of the

problems are related to infringements of the guidelines 1.1.1., 1.4.4., and 2.4.4. of the WCAG (lack of accessibility elements in the HTML code, formatting aspects and no compatibility with assistive technology devices).

### 5. CONCLUSIONS AND FUTURE WORKS

Accessibility is currently an important aspect to be considered in software products. Designing user interfaces contemplating people with different skills and regardless of their abilities and capabilities is essential. This fact is relevant not only because there could be local laws that establish the degree in which the accessibility must be considered in the software development process (as in Peru over the Resolution No. 126-2009-PCM); but also, because the access to technology is a human right of all people around the world.

In this research, the purpose was to determine the degree of awareness that companies in Peru have regarding accessibility through the conduction of a case study in which the top five of Peruvian e-Commerce companies were evaluated. The results show that in this country, despite having a local normative and regulation, the websites have multiples accessibility errors. In Peru, the standard is not respected despite the existence of a government initiative, causing a large ratio of the population to be neglected.

The results place to Linio as the most accessible website. This scenario could be explained by the fact that this company was born since its inception as a digital enterprise. On the contrary, unlike, the other companies are known physical stores in the market that have aligned themselves with the technological trend by developing websites to provide a new online channel for the sale of products. However, none of the evaluated web sites meet the minimum level of compliance. Although they have fewer problems at level AA, to establish that they meet this level it is necessary that they first exceed level A.

Moreover, AChecker has proved to be online tool with a lot of potential to perform accessibility evaluations. Furthermore, it can be used freely without need of acquiring a license, even in a software development process. This tool is programmed to verify the HTML code against the standard WCAG and other proposals, from the level A to AAA. The only disadvantage is that there is no possibility of executing the evaluation against the last version of the standard WCAG 2.1.

Finally, more case studies can be executed in several domains and different countries to generalize the results. Comparative studies between the different regulations that exist in different countries would be an interesting contribution to the HCI area. Another study of interest would be to verify if the accessibility degree is related to the usability degree of the

websites. In a previous work [16], some metrics were proposed with the goal of quantifying the user experience of a website. This approach could be used to determine if there is a degree of correlation between usability and accessibility in a specific domain. In the same way, it would be significant to define standards adapted to each country establishing minimum guidelines that must be met to make websites accessible to any individual, regardless of their skills and capabilities.

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