An Analysis of Website Accessibility in Higher Education in Indonesia Based on WCAG 2.0 Guidelines

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Abstract. Website accessibility is a simple way to access a website by everyone so that information on the website can be easily understood. This study aims to improve the accessibility of universities’ website to analyze website accessibility problems based on WCAG 2.0 guidelines. This study analyzed 13 universities’ websites in West Java, Indonesia by using TAW as an evaluation tool. The evaluation results were presented in a graph showing the error rate of each university’s website. The same errors that occurred in almost all websites were: non-text content, info and relationships, page title, link purpose, language of page, on input, labels and instructions, parsing, and name, role, value criteria. This study was expected to provide information to the university and to perform as guidelines for website accessibility improvements.

1. Introduction
The development of internet-based media has made many organizations aware of the importance of online media to support their business and promote their existence [1]. Likewise, Education cannot be separated from the role of academic websites as information providers and media of promotion for every educational institution.

Some of the main uses of academic websites include promotion of expertise programs, academic research, e-learning support for students, communication to public and vacancy advertisement at schools or at the universities [2]. One effort that can be done to optimize the purpose or usefulness of an academic website is by improving the accessibility of the website to facilitate users in accessing it.

In addition, some research indicates that there are several factors that influence the ranking of websites in webometrics. One of such factors is the accessibility of the website [1].

Academic website accessibility can facilitate everyone to understand the information provided in the website. An accessible website is a website that even the disables can experience, understand, navigate and interact with the website and they can contribute to the website. Accessibility has another benefit for the elders who lost their ability because of aging [3].

Website accessibility is still a problem for many top Universities around the world [3]. Similar to a building, a website should be designed to meet everyone’s needs, including
people with disabilities. However, many websites ignore the users’ need so that it may decrease users’ interest to the websites [4]. Website accessibility can be improved by meeting criteria provided in Web Content Accessibility Guidelines (WCAG) [5]. Therefore, College website accessibility is urgently required.

2. Literature Review

2.1. Academic Website

Academic website is one of the most important media for the public to access information and obtain information services [6]. A website is an integral part of formal education. In Taiwan, every school, at any level, has its own website. School websites not only allow students and parents to learn about the activities at school, but also simplify the administrative processes, improve efficiency, and gradually promote teaching with the digital environment [7].

2.2. Website Accessibility

The ease for community in accessing the academic website cannot be separated from the accessibility of the website. The accessibility of a good website is very influential for users of the website to access the available information in it, either for the general public or for the students. The better the accessibility is, the easier the public access the academic website.

Website accessibility means that anyone who uses this type of web browsing technology should be able to visit any site and gain full and complete understanding of the information as well as having full and complete ability to interact with the site [8]. Website accessibility becomes a basic prerequisite to ensure the equal rights for everyone in accessing information [6].

2.3. Web Content Accessibility Guidelines (WCAG) 2.0

To improve the ranking of Higher Education websites, it is necessary to evaluate the content and suitability of the website using a global standard created by the World Wide Web Consortium (W3C), an independent international body that creates Internet standards and programming languages. Since 1999, the W3C has issued several rules and recommendations to improve the accessibility of a website, the rule in question is WCAG guidelines [5].

WCAG is an internationally accepted guideline consisting of guidelines and checkpoints that provide specifications on how to develop the accessibility of a website [9]. The WCAG guidelines can be accessed in the official W3C website (www.w3.org). WCAG plays an important role in establishing a website accessibility standard.

There are several principles that a website must follow to ensure website accessibility:

- Perceivable - Information and user interface components must be presentable to users in ways they can perceive. It means that users must understand the information provided in the website.
- Operable - User interface components and navigation must be operable. This implies that users must be able to operate the interface.
- Understandable - Information and the operation of user interface must be understandable. It indicates that the users should understand the information and user interface operation.
- Robust - Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies [10].

There are other organizations that focus on accessibility issues, but the W3C guidelines are more sophisticated. Accessibility is supported by developing WCAG guides from version 1-2 [11]. According to the W3C, every website must meet WCAG 2.0 criteria [5].
2.4. Website Accessibility Evaluation

To test the accessibility of a website, there are several different evaluation and improvement tools in using the guidelines. However, most of these tools follow the WCAG guidelines [12].

Website accessibility evaluation tool is an online software or services program that helps determine whether or not a website meets the web accessibility guidelines. These tools can be categorized into two types:

- A general evaluation tool, which evaluates almost any guideline; e.g. TAW and AChecker.
- Specific evaluation tools that evaluate specific topics covered by web accessibility guidelines, such as Color Checker [12].

Accessibility should be evaluated to ensure that it provides the desired destination of the site. Evaluating website accessibility can help designers and developers to improve their website based on evaluation results [13].

2.5. TAW Evaluation Tool

TAW was developed by Spanish Fundación CTIC. TAW is a tool used to analyze web accessibility with an overall global analysis of items and pages from a site that aims to check the accessibility of websites and development for access to any individual regardless of the website's characteristics. TAW measurement results are presented in the forms of number of violations or accessibility issues of any WCAG guidelines criteria.

The tool analyzes the site in accordance with the W3C Web accessibility guidelines (WCAG 1.0 and WCAG 2.0) by providing improvements and recommendations. Some errors are generated from TAW regarding Hyper Text Markup Language (HTML), they are not normally generated by other tools [12].

3. Methods

To analyze the website accessibility, this study used content analysis and survey method with qualitative approach. Surveys were conducted by observing the results of website accessibility analysis by using TAW evaluation tool. To get the facts from the problem and to find factual information about the accessibility of the website. The sample of this research is academic websites of universities in West Java under Ministry of Research, Technology and Higher Education.

The evaluation tool used in this research was TAW. TAW is one of the online evaluation tools functioning to measure the accessibility of a website. In the application, it must be connected to the internet network and the result is in the form of number of problems or errors of a website in meeting the criteria of a website according to WCAG 2.0. The data obtained using the TAW evaluation tool was taken on September 23, 2016 [14].
3.1. Research Procedure

The first step in this study was to conduct a literature study by reviewing international journals from reliable sources related to website accessibility. This was intended to inspire the author base and knowledge about the importance of accessibility of a website before executing research.

The second step was to collect the data by observing the website in each college which was then analyzed using TAW to get the number of problems or violations from every State University website.

The third step was to do data processing obtained from TAW by using Microsoft Excel. The next step was to make conclusions and recommendations on the accessibility of the website of State Universities in West Java and the final step was making the reports.
3.2. Data Analysis Technique

Once the data was collected, the next step was to analyze the data. Data obtained from TAW were errors or violations on the website. Each data was grouped according to the criteria of the WCAG 2.0 guideline. The data was processed by the error of each success criterion of certain guidelines, and then divided by the number of errors of the success criteria in the guidelines multiplied by 100%.

4. Results and Discussion

4.1. TAW Evaluation Tool Result

The following table describes the error criteria on WCAG 2.0 guidelines that become a problem at 13 State Universities in West Java resulting from TAW evaluation tool.

**Table 1. TAW Evaluation Tool Result of University in West Java**

| ERROR CRITERIA | UI | UNPAD | UPI | POLMAN | UNSHK | IPB | ITB | POLBAN | UNSIK | JSBI | STFTT | POLINDRA | STKS |
|----------------|----|-------|-----|--------|-------|-----|-----|--------|-------|------|-------|-----------|------|
| 1.1.1 Non-Text Content | 17 | 14 | 15 | 0 | 5 | 9 | 0 | 0 | 6 | 1 | 1 | 36 | 0 |
| 1.3.1 Info and Relationships | 346 | 14 | 7 | 1 | 17 | 38 | 0 | 1 | 2 | 55 | 10 | 7 | 0 |
| 2.4.2 Page Title | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 2.4.3. Link Purposes | 26 | 19 | 23 | 0 | 3 | 20 | 0 | 0 | 12 | 1 | 4 | 14 | 0 |
| 1.1.1 Language of Page | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3.2.2 On Input | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 3.3.2 Labels or Instructions | 17 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 4 | 0 |
| 4.1.1 Parsing | 75 | 8 | 1 | 0 | 16 | 15 | 2 | 1 | 3 | 26 | 14 | 92 | 0 |
| 4.1.2 Name, Role, Value | 19 | 0 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 1 | 1 | 4 | 2 |
| TOTAL | 501 | 56 | 46 | 3 | 45 | 84 | 3 | 4 | 24 | 86 | 32 | 159 | 3 |

Table 1 shows that the most number of guideline violations found on University of Indonesia website with 501 violations and the smallest number of errors exist in three websites; POLMAN, ITB and STKS with the three error criteria.

4.2. Number of Error Criteria Occurrence

Of the 13 websites of State Universities, there are nine criteria that become errors in accessibility with different number of occurrences. The number of occurrences of each error criterion can be seen in table 2.

**Table 2. The number of occurrences**

| PRINCIPLES | ERROR CRITERIA | OCCURANCES |
|------------|----------------|------------|
| Understandable | 1.1.1 Non-text content | 9 |
| | Info and Relationships | 11 |
| Operable | Page Title | 2 |
| | Link Purpose | 9 |
| Understandable | Language of Page | 11 |
| | On Input | 1 |
| | 3.3.2 Labels or Instructions | 7 |
| Robust | 4.1.1 Parsing | 11 |
| | 4.1.2 Name, Role, Value | 9 |
| TOTAL | | 70 |
The occurrence of error criteria in the table above shows that there are three criteria that often arise and violate the website accessibility of State Universities in West Java with 11 occurrences. Those criteria are info and relationships, language on the page, and parsing. From the number of occurrences of the criteria in question, they are presented in the form of diagrams as in Figure 2.

![Figure 2. Percentage of Error Criteria Occurrence](image)

4.3. Error Criteria

4.3.1. Non-text Content
All non-text content that is presented to the user has a text alternative that serves the equivalent purpose. These criteria make the information submitted by non-text content accessible through the use of alternative text. Alternative text is the primary way to make information accessible to all users of the website. Providing text alternatives allows information to be input in various ways by the creator of the website to match user needs [10].

4.3.2. Info and Relationships
These criteria encourage website creators to ensure that information and relationships are understood through visual or hearing format. In this criterion the visual presentation formats are:
- The title used larger font size and are bold printed and separated by line space.
- The list of items is preceded by a sign and perhaps indented
- Paragraphs are separated by line spaces
- Different background colors can be used to indicate that some items are related to each other
- Words that have a special status are marked by different fonts, bolded, italicized or underlined.

In addition to the visual format, on this criterion the auditory format can also be used to convey information and relationships. For example, it provides a change of tone that can be used to emphasize important information or to show the quoted text [10].

4.3.3. Page Title
Web pages have titles that describe topic or purpose. This criterion intends to help users find content and adapt within it by ensuring that each web page has a descriptive title. The title identifies the location without requiring the user to read or interpret the page content. When a title appears on a sitemap or a search results list, users can identify the content they need more quickly [10].

4.3.4. Link Purposes
These criteria encourage website designers to help users understand the purpose of each link so they can decide if they want to follow links. Where possible, they provide text on links that identify link
destinations without the need for additional context. For example, in a case where links to a document or web application, simply name the link with the name of the document or web application [10].

4.3.5. Language of Page
This criterion encourages website creators to ensure that website creators provide information on their web pages by providing other languages other than the primary language used [10].

4.3.6. On Input
These criteria encourage website makers to ensure that entering data or selecting a form of control has a predictable effect. The benefit of these criteria is to help users who have limitations by making interactive content more predictable. Unexpected changes from the context can be so confusing for users with visual limitations. For example, people with visual limitations may have difficulty knowing when a visual context change has occurred, as new windows pop up. In this case, the user's warning of an interface context change minimizes the confusion when the user finds that the back button is no longer behaving as expected [10].

4.3.7. Labels or Instructions
This criterion encourages the content creators to have the label or instructions of each user interface control used to identify those controls so that the user knows the expected data from the control [10].

4.3.8. Parsing
This criterion encourages the website designer to interpret and parse the content accurately. The content was implemented using markup languages, all elements have complete start and end tags, all elements are nested according to their specifications, all elements do not contain duplicate attributes, and any IDs are unique, except where the specifications allow these features.

4.3.9. 4.1.2 Name, Role, Value
According to World Wide Web Consortium (W3C), the purpose of this criterion is to ensure that Assistive Technologies (AT) can collect information, enable set up and keep updating the status of user interface controls in the accessed content.

Assistive Technologies (AT) is a product, equipment, and system that improves learning, working, and daily living for people with disabilities [10].

5. Conclusion
Accessibility of the website is an important thing for the owners to consider in making a university website, because with accessibility, a website can facilitate users in accessing and information submitted. In addition, the accessibility of the website can also affect the ranking of websites in webometrics which is the ranking of university websites in the world. Website accessibility analysis can be done with the help of software. One of which is TAW software.

Website of State Universities in West Java has not fully qualified website accessibility. This is because it still violates some criteria from WCAG 2.0 guidelines in terms of website accessibility. Similar errors occur almost entirely on the entire website: non-text content, info and relationships, page titles, link destinations, languages on the page, when entering data, labels and instructions, parsing, and name, role, value criteria.

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