Investigating the Performance of Accessibility Checker Tool for Educational Websites in Web 2.0

[1] Dr.J.Seetha
[1] Assistant Professor, Department of Computer Science, SRM Institute of Science and Technology, Ramapuram Campus ,Chennai
[1] seetha.venkat80@gmail.com

Abstract: In recent days, web 2.0 has become a popular tool including free digital programs which is utilized to create and share student created projects and products. They are cooperative, multi-purpose, easier to utilize digital platform which boost students for interacting with others or generate and share individualized response product. At the same time, web accessibility checking tools play a vital role in Web 2.0. Therefore, this paper aims to investigate the performance of Accessibility Checker (AChecker) tool for education and learning websites in web 2.0. The AChecker validates HTML content for web accessibility issues by providing the location of web page, uploading an HTML file, or pasting the whole HTML source code from a website. It generates a report of every web accessibility problem for the chosen guidelines for the known, likely, and potential problems. In addition, the AChecker tool is used to examine a set of 25 websites related to education and learning. A brief performance analysis of the AChecker tool takes place using WCAG 1.0 and WCAG 2.0 guidelines. The experimental outcome indicated that the websites are required to be improved for accessibility by everyone.

Keywords: Web 2.0, Education, Web accessibility, WCAG 1.0, WCAG 2.0, AChecker tool

I. INTRODUCTION

The emergence of technology has improved the utilization of World Wide Web (WWW), and for better access to materials and information. At present, there has been a presentation of distinct techniques to assist human communication and interaction [1]. Because of this advancement, many peoples are now having the privilege to navigate the Web, regularly, for personal purposes and they are own specific. In the area of Education, Internet based education has evolved and currently, it is utilized for educational delivery [2-4]. Indeed, the broad ranging of teaching technology for knowledge based education provides new and inspiring possibilities for both teaching students and faculty. In the past years, there has been a lot of discussion regarding the certain types of Web 2.0 Technology, learning technologies that have created the way for social web systems, and have the capability of improving student learning results.

Web 2.0 tool is a free digital program which could be utilized to create and share student created products and projects. They are user-friendly digital platforms, multi-purpose, interactive that inspire students to create and share individualized response products/collaborate with each other. Web 2.0 tool provides students to interact with each other, and mainly, learn from the course material.

They are highly useful for teaching and assessment exercises intended for increasing the student engagement, requires student to verbalize insight or summarize information, into their theoretical basis via conventional writing exercises. Web 2.0 tools also give students an opportunity for interacting with others as they share its knowledge. Students could cooperate with their schoolmates to generate response product, or it could share finalized product with peers in its class, student in another section, or another learner all over the world. Web 2.0 tool creates an opportunity for the students for sharing what they are learning with broader listeners.

Though Web 2.0 has been initially created, outside of educational context, the term is established in an educational vocabulary for online instructions. Web 2.0 represents a novel generation/version of web technologies that occurred because of the collective variations in how the web is designed & used. Different from the previous system, Web 2.0 function as platform for the networking and sharing of user generated and interactive content [5]. [6] establish that "Web 2.0 is a more socially related web, where everybody is edit and add the data space". Web 2.0 offers a new, engaging, and more social method of communication. [7] reveals that "Ever since Internet users are heavily based on this novel web" for its social and

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communication need. Web 1.0, earlier „version" of the web, offered mainly a „one-way" transmission channel among consumer and author of web content".

The advancement of Web 2.0 is resulted in a novel dimensional of WWW. Now, the Internet user becomes quite active on the internet [8]. Web 2.0 doesn't mean similar things for every person; indeed, based on an individual understanding, either it could be utilized for professional development and bolster personal, or it could be utilized as tool for socialization purpose. Few researchers even assume that Web 2.0 provides for interactivity and interaction when permitting user for managing its personal information and data [9, 10]. Other researchers consider Web 2.0 as a group of tool that request active contributions from their user [11, 12].

This paper investigates the performance of Accessibility Checker (AChecker) tool for education and learning websites in Web 2.0. The AChecker validates HTML content for web accessibility issues by providing the location of a web page, uploading an HTML file, or pasting the whole HTML source code from a website. It gives the report of every web accessibility problem to elected guidelines for the known, likely, and potential problems. Moreover, the AChecker tool is used to inspect a set of 25 websites interrelated to education and learning. An extensive experiment analysis of the AChecker tool is carried out against WCAG 1.0 and WCAG 2.0 guidelines. The remaining sections of the paper is organized as follows. Section 2 defines the AChecker tool and its impact on Web 2.0. Then, section 3 examines the performance of the web accessibility results and section 4 draws the conclusion of the study.
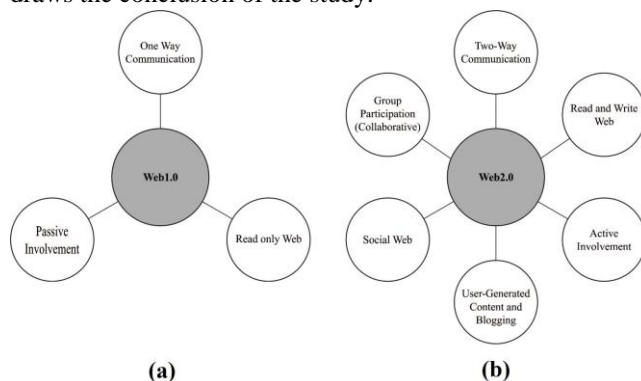
Fig. 1. Characteristics of (a) Web 1.0 and (b) Web 2.0

II. ACHECKER TOOL AND IMPACT OF WEB 2.0 ON EDUCATION

AChecker was made with the aim of offering an accessibility checking tool that was hundred percent interactive, transparent, free, and customizable. AChecker utilizes Open Accessibility Checks (OAC) that is a group of checks depending upon each web accessibility guideline presented around the world. Now, it has an overall of 310 OAC checks utilized by the AChecker.

AChecker has certain characteristics for developers, registered users, public users, and administrators.

AChecker is utilized for analyzing HTML content to check accessibility problem by providing the URL of web page, upload HTML source code of the Web page. The depiction of AChecker tool webpage is displayed in Fig 1. The AChecker tool is utilized for testing the conformity of accessibility standards to recognize the web content i.e., accessible ball kind of peoples. It has several choices that are present for checking the web pages. In this work, they utilized three priority levels i.e., Priority 1, Priority 2, and Priority 3 for checking the accessibility regarding WCAG 1.0 rules.

Additionally, these levels are utilized namely Level 1, Level 2, and Level 3 for checking the accessibility regarding WCAG 2.0 rules. Also, it is utilized for evaluating the web pages under Sect 508 rules. The main testing of websites is performed by the automated evaluation tool succeeded by manual testing. AChecker creates the result on the basis of selected rules amongst WCAG 1.0, WCAG 2.0, and Sec 508. It is utilized for finding three kinds of potential, known, and likely errors correspondingly.

- Known errors: It is deliberated as accessibility problems that should be corrected.
- Likely errors: It is deliberated as possible problems, however, it requires a manual process to alter the pages and resolve the problem
- Potential errors: It isn't recognized by the AChecker and requires manual decisions.

In the following, the merits and demerits of employing Web 2.0 in education are given below.

- Decrease the cost;
- Flexibility as much as the likelihood of selecting technologies is considered;
- Faster and easier accessing to the data, where and when it is required;
- The incorporation of distinct Web 2.0 techniques in the teaching learning activities;
- Wide possibility of data and cooperation by the agency of social bookmarking service;
- Opportunities to manage access to the resources

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by validating user;
- share cumulated experience's (microblogs, blogs, youtube wikis, flickr,) and assets;
- Independent from the platforms (a browser, Internet connection, and computer is sufficient);
- Consistency with the components of the educational field and the present contextual dynamics;
- The lower level of complexity required for using (minimal expertise via Internet);
- Trustworthiness in continual use, on a longer period;
- Reallocation of efforts, thus reducing energy and time is consumed at the time of information and search managing (del.icio.us, RSS);
- The increasing number of models of usage and the heterogeneity of types of formation and didactic practices, because of the variety of novel techniques;
- Opportunity for testing the present didactic practices, without huge modification in the present modus operandi;
- • the main emphasis on didactic improvement, and not on the technology for itself;
- Generating digital content (particularly video casting, media, and podcasting).

Next, the demerits of applying Web2.0 are given as follows.
- Internet connection is needed (particularly a broadband connection);
- It hides behindhand a number of concepts and technologies that are still inadequately determined;
- It is depending upon Ajax, that is based on JavaScript and, hence, a user without activated JavaScript, cannot utilize the respective page;
- It defines variants of interpretation among kinds of browser;
- It provides free thing, in publicly-available structure, instead of vague significance;
- It results in lower quality of the real content, with sites that struggle in deep informational mediocrity;
- It stimulates amateurishness by invaluable content created by the user;
- It provides opportunity to each person for complaining, therefore creates a community without rules;

- It has monetary quantification (the Internet as a business - Google);
- It is a type of secondary Web, a medium for the person with lower digital capabilities;
- It has constrained security;
- The speed of program is very low compared to one of desktop programs;
- It does not mean anything for itself, it is electronic junk;
- The highly different offers technology that could be utilized and currently occur on the market, create the real selection procedure challenging;
- Knowledge and time participated in the Web 2.0 technology.

III. RESULTS ANALYSIS

This section investigates the set of websites using AChecker tool under WCAG 1.0 and WCAG 2.0 guidelines.

Table 1 and Fig. 2 offer the AChecker tool report generated for 25 websites under WCAG 1.0 guidelines with three conformance levels. The statistical results are examined under known, likely, and potential errors.

The AChecker tool shows a number 403, 1058, and 3494 known, likely, and potential errors under the conformance level A. Meanwhile, the AChecker tool depicts a number 204, 3449, and 7261 known, likely, and potential errors under the conformance level AA. Eventually, the AChecker tool demonstrates the numbers 620, 4173, and 6885 known, likely, and potential errors in the conformance level AAA.

Table I. AChecker tool report for 25 websites (WCAG 1.0)

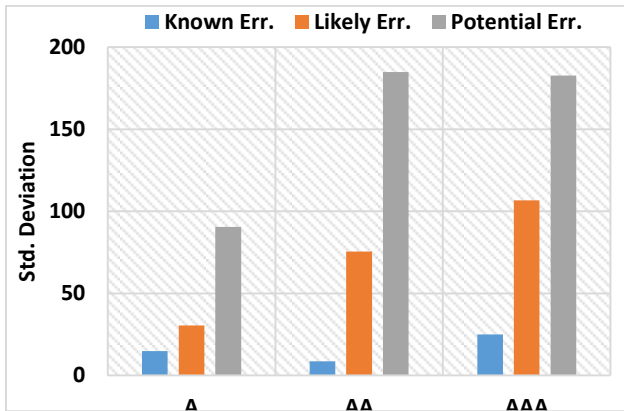| Conformance Level	Statistical Results	Known Err.	Likely Err.	Potential Err.
A	Total	403	1058	3494
	Average	18.31	48.09	158.8
	Standard Dev.	14.81	30.38	90.48
AA	Total	204	3449	7261
	Average	8.16	143.70833	290.44
	Standard Dev.	8.58	75.55	184.9
AAA	Total	620	4173	6885
	Average	24.8	166.92	275.4
	Standard Dev.	25.00	106.68	182.57

Fig. 2. AChecker tool report for 25 websites (WCAG 1.0)

On conformance level A, the SD of the known, likely, and potential errors are 14.81, 30.38, and 90.48 respectively. Besides, on the conformance level AA, the SD of the known, likely, and potential errors are 8.58, 75.55, and 184.9 correspondingly. Moreover, on the conformance level AAA, the SD of the known, likely, and potential errors are 25.00, 106.68, and 182.57 correspondingly.

Table 2 and Fig. 3 give the AChecker tool report created for 25 websites in WCAG 2.0 guidelines with 3 conformance levels. The statistical outcomes are inspected in known, likely, and potential errors.

The AChecker tool illustrates the number 477, 9, and 11669 known, likely, and potential errors in the conformance level A. Likewise, the AChecker tool demonstrates a number 1240, 9, and 12359 known, likely, and potential errors under the conformance level AA. Lastly, the AChecker tool depicts a number 1230, 7, and 11639 known, likely, and potential errors under the conformance level AAA.

Table II. AChecker tool report for 25 websites (WCAG 2.0)

Conformance Level	Statistical Results	Known Err.	Likely Err.	Potential Err.
A	Total	477	9	11669
	Average	19.08	36.00	466.76
	Standard Dev.	19.92	95.00	284.08
AA	Total	1240	9	12359
	Average	56.36	40.00	561.77
	Standard Dev.	74.80	95.00	289.11

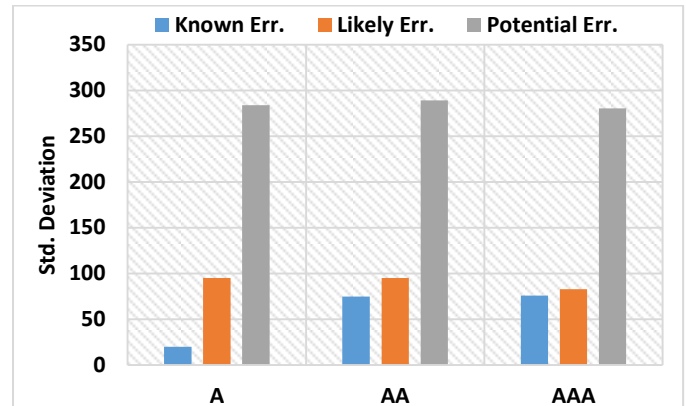|				
AAA	Total	1230	7	11639
	Average	55.90	36.00	529.04
	Standard Dev.	75.87	83.00	280.52

Fig. 3. AChecker tool report for 25 websites (WCAG 2.0)

On conformance level A, the SD of the known, likely, and potential errors are 19.92, 95, and 284.08 correspondingly. Also, on the conformance level AA, the SD of the known, likely, and potential errors are 74.80, 95, and 289.11 correspondingly. Furthermore, on the conformance level AAA, the SD of the known, likely, and potential errors are 75.87, 83, and 280.52 respectively.

IV. CONCLUSION

This paper has examined the outcome of the AChecker tool for education and learning websites in web 2.0. A set of 25 e-learning and educational websites has been assessed using the AChecker tool. In addition, the merits and demerits of web 2.0 in educational sector have been elaborated. Moreover, an extensive comparative study of the AChecker tool on WCAG 1.0 and WCAG 2.0 guidelines takes place interms of different measures. The experimental outcome indicated that the websites are required to be improved for accessibility by everyone. In future, we focus on the design of new automated text to speech synthesizer tool for Web 2.0 and assist students in the learning process.

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