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Usability Evaluation of Encyclopedia Websites

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Abstract—Usability is an important aspect that every website should focus more. It tells us how well and success website will function with real users. Many people often think usability tests are expensive and time-consuming. It can be a cost-effective and time saver with usability testing instead of spending more time fixing an unusable website. This study evaluates the usability of encyclopedia websites by using automated usability testing tools and questionnaire methods. The questionnaire was developed based on a standard form called Website Analysis and Measurement Inventory (WAMMI) that identified 20 common usability questions divided into five categories. Each category deals with one aspect of usability. Simultaneously, the automated usability testing tools used in this study were Pingdom and GT Metrix to calculate and analyse the website performance of selected encyclopedia websites based on website components including page load time, media size and overall web performance grades. This study could help web designer, developer, and practitioners design better and more user-friendly encyclopedia websites.

Keywords—Usability, testing, pingdom, GT metrix, load time, performance

I. INTRODUCTION

The online encyclopedia is available widely for public and is usually in free form or maybe a subscription-based. "Unless a web site meets the needs of the intended users, it will not meet the needs of the organisation providing the web site. Web site development should be user-centred, evaluating the evolving design against user requirements" [1]. Usability is a factor that determines whether the presentation of a website is presented in an exact way to provide users with a better experience [2]. As for today, people tend to use a website with rich in usability than the one with less usability. It is because

usability provides the website with an exciting element to the users that meet their needs. In contrast, for a website with less usability, users are disinterested in using it and always go back to the search engine to find another website. Web usability can be defined as how easy and convenient for users to use the website in terms of its effectiveness, efficiency, and satisfaction [3]. The success or failures is determined by the ease or difficulty a user encounter with the website system [4]. A useful website tells us that users expectations are well met when they obtained their specific goals through the website. When users find their information, they seek less effort in a short period, thus suggesting the website is a very efficient website. Also, the satisfaction is where users find the website having and answered most of the information they wanted. Some of the critical factors that significantly impact website usability are accessibility, responsiveness, search engine optimisation, SEO, content and messaging, web layout and navigations, errors tolerance and effectiveness, and time spent to complete a task and expectations. Six critical categories of quality features: accessibility, reliability, usability, performance, sustainability, and portability, are listed in the ISO/IEC 9126-1 standard, and 90 per cent of websites are estimated to provide poor usability [6]. We may conclude that web usability is a core element of web quality.

This paper is taking the online encyclopedia as the sample. The knowledge offered by online encyclopedia is in a mass amount, high accuracy, up to date. The most appealing part is that it is free for the public over traditional sources like books and newspapers. The interactive website elements such as navigation bars, menus, content, images, videos, hyperlinks, buttons, and forms must be put into high consideration by the developer/designer. By prioritising those elements, the website

will produce good usability attributes such as effective, efficient, and satisfactory [5].

This paper aims to evaluate an online encyclopedia using an automated usability testing and questionnaire method and produce an evaluation analysis based on the web usability characteristic: effectiveness, efficiency, and satisfaction. This research is expected to introduce a new way of evaluating web usability by combining automated usability testing methods with the questionnaire method which can help web designer, developer, and practitioners design better and more user-friendly encyclopedia websites.

II. RELATED WORK

Komal Raikar, Sushopti Gawade, Swati Chopade [7] evaluated the website of Agricultural using three automated tools: Qualidator tool, Website Grader, and Seoptimer. This paper also discussed how the usability of a website affects rural people. Anwarul Islam, Keita Tsuji [8] discussed the usability of University websites in Bangladesh. By using two automated online tools: HTML Toolbox and Webpage Analyser. Their study found that users are not satisfied with the websites' overall usability, and only a few found satisfactory. Ramesh Babu B., Ramalingam Jeysankar, Nageswara Rao P. [9] presented a study using the Webometrics approach to investigate and analyse web page content and hyperlinks usage and web technology. The websites are ranked according to the web impact factors. Adrian Fernandez Martinez, Silvia Abrahão, Emilio Insfran [10] discussed and compared the researchers' effective usability evaluation methods. The paper also shows a result review systematically to researchers who aim to practice effective web usability evaluations. Mirfa Manzoor, Walayat Hussain [11] used an online Google survey form to evaluate web usability. A self-developed model is used for evaluation against the top-ranking universities in Asia. Its outcome shows that only part of the web sites considered is usable. Ahmad A. Al-Ananbeh, Belal Abu Ata, Mohammed Al-Kabi, Izzat Alsmadi [12] evaluated eighty universities' websites. Three automated tools are used: HTML ToolBox, PageRank Checker, and SEE Page Rank for evaluation. The results showed that the website attributes do not usually correlate each other. Soohyung Joo, Suyu Lin, Kun Lu [13] evaluated the academic library web sites by developing a usability evaluation model and using data surveyed from users. The study was concluded that a standardised method might be able to act as a sample to create a measurement tool to evaluate the usability attributes of the web sites. Abeer Rafi'I Al Abdulraheem, Rabab Abumaloh, Waheeb Abu-Ulbeh [14] discussed an approach using WEBUSE model to evaluate the Jordanian Banks web sites usability. The research found that the bank websites are close in term of attributes according to WEBUSE index. Lukas Kakalejcik, Jozef Bucko [15] presented a study by doing a user experience testing method and also measure the evaluation using an existing developed usability model: The Iceberg Model of Website Usability. It checked and analysed the problem in three sections introduced by the model. In [16], the author presented a methodology for evaluating e-Commerce web sites to identify e-shop web sites'

strengths and weaknesses. The metrics are obtained from expert judgment, data from the shop's database, analytical data, and internet resources.

III. TOOLS FOR MEASURING WEB USABILITY

When building a brand-new website, numerous things should be considered, such as website attractiveness to attract more people. Furthermore, the website must have sufficient and enough information to the readers, which aids them obtain their objectives. It will satisfy people who visit the websites if they know how to navigate the site [17]. This study utilised technique called usability testing to evaluate a website. Several tools are available, allowing the website owner or visitor to perform a test to the website, such as Pingdom, and GTMetrix tool. Performance testing is conducted using automated Usability Testing tools. The performance was determined through several aspects: time to response and load, bandwidth used, and page size. The performance of the online encyclopedias is evaluated by using Pingdom and GTMetrix. The comparison between these tools is shown in the following table. It shows that the evaluation criteria or factors are similar for both Pingdom and GT Metrix usability evaluation tools.

TABLE 1. Tools for Measuring Common Aspects

Tools used	Performance	Number of Requests	Speed	Time to Load	Size of Page
Pingdom	/	/	/	/	/
GTMetrix	/	/	/	/	/

IV. EXPERIMENT AND RESULT

The list of websites being evaluated is listed in Table 2. The selection was based on a keyword search of the top list of online encyclopedias based on the general reference category.

TABLE 2. List of Online Encyclopedia Website

Name of the Online Encyclopedia	URL of Websites	Symbol
Conservapedia	https://www.conservapedia.com/Main Page	OE1
Encyclopedia	https://www.encyclopedia.com/	OE2
Citizendium	http://en.citizendium.org/	OE3
Everipedia	https://everipedia.org/	OE4
Everything2	https://everything2.com/	OE5
Metapedia	https://en.metapedia.org/wiki/Main_Page	OE6
New world encyclopedia	https://www.newworldencyclopedia.org/entry/Info:Main Page	OE7
Wikipedia	https://en.wikipedia.org/wiki/Main_Page	OE8
Scholarpedia	http://www.scholarpedia.org/article/Main Page	OE9
Superpedia	https://superpedia.rumahilmu.or.id/wiki/Halaman Utama	OE10

A. Website Performance by Pingdom and GTMetrix

The table and graphical graph below represent and illustrate the overall performance result according to Pingdom and GTMetrix tools. Fig. 1 shows that the Pingdom tool results from OE6 website with best in performance for 96%. GTMetrix tool results from the website OE5 as best in performance aspect than other websites for 100%. Both OE2 and OE3 get the same percentage of loading speed for 71%. Some loading results showed much different such as OE4 (Pingdom: 86, GT Metrix: 53) and OE6(Pingdom: 96, GT Metrix: 53). The difference in performance value may be due to a difference in web server testing location and web server performance stability. However, we need further testing to confirm these.

TABLE 3. Performance Result Generated by Pingdom and GTMetrix

Encyclopedia Symbol	Performance (Website Speed)	
	Pingdom Tool	GT Metrix
OE1	83	84
OE2	64	71
OE3	75	71
OE4	86	53
OE5	91	100
OE6	96	53
OE7	71	25
OE8	86	81
OE9	77	64
OE10	81	66

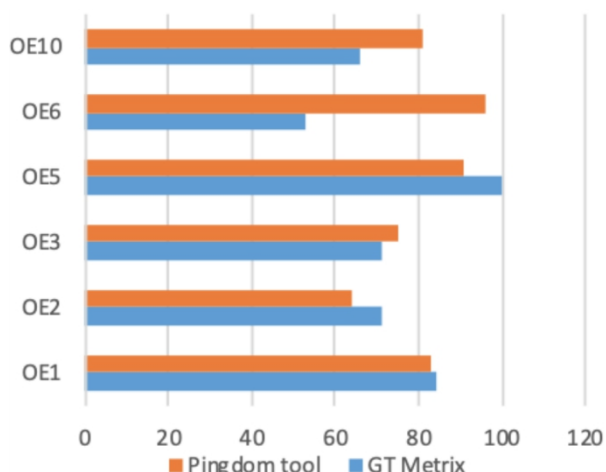


Fig. 1. Graphical Illustration of Table 3

Furthermore, based on GT Metrix evaluation, Encyclopedia.com (OE2) and Citizendium (OE3) have the same web performance. However, based on Pingdom evaluation, web performance has a minimal difference. These show that web performance for both encyclopedia platform (OE2 dan OE3) is consistent.

B. Detailed Website Performance

Performance result evaluated by Pingdom and GTMetrix tools is to find the speed score of a page, requests number, time to load, and the page's size. The detailed output is shown in Table 4 and 5.

TABLE 4. Results Generated by Pingdom

Encyclopedia Symbol	Performance (Grade)	Requests	Time to Load	Size of Page
OE1	83	22	4.33s	217.8kb
OE2	64	100	545ms	2.4mb
OE3	75	20	3.25s	515.0kb
OE4	86	28	445ms	1.6mb
OE5	91	15	1.55s	93.5kb
OE6	96	5	121ms	20.3kb
OE7	71	63	2.12s	863.2kb
OE8	86	36	1.17s	421.0kb
OE9	77	71	3.75s	881.7kb
OE10	81	15	2.23s	658.3kb

TABLE 5. Results Generated by GTMetrix

Encyclopedia Symbol	Speed Score (Page)	Number of Requests	Time to Load	Size of Page
OE1	84	22	3.1s	207kb
OE2	71	92	1.6s	2.12mb
OE3	71	20	2.7s	497kb
OE4	53	130	23.4s	9.11mb
OE5	100	11	1.0s	82.5kb
OE6	53	36	2.4s	1.27mb
OE7	25	486	11.6s	1.72mb
OE8	81	36	0.9s	376kb
OE9	64	67	5.1s	804kb
OE10	66	15	4.8s	638kb

C. Overall Website Performance

An overall result is shown in Table 6, which provides maximum scores of online encyclopedia websites in counter to the measure aspects by Pingdom and GTMetrix tool. It shows all selected online encyclopedias have their strength and get good scores based on different evaluation factors listed except for the OE1, OE9 and OE10. These three online encyclopedias have not performed well in any element of usability evaluation based on GT matrix and Pingdom.

Two encyclopedia websites OE5 and OE6 scored maximum in performance and speed, which shows that they are among the best online encyclopedia based on usability evaluation. OE2 and OE7 site acquires the maximum number of requests by the visitor, OE6 and OE8 receive the best time to load. The size page of OE2 and OE4 are relatively larger to load.

TABLE 6. Overall Performance Analysis

Factors	Tools	
	Pingdom Tools	GT Metrix
Performance	OE6	-
Speed	-	OE5
Response time	-	-
Requests	OE2	OE7
Load time	OE6	OE8
Page size	OE2	OE4
Mobile	-	-
SEO	-	-
Security	-	-

D. Questionnaire

WAMMI questionnaire is selected for one of the evaluation methods. WAMMI is an abbreviation of Website Analysis, and Measurement Inventory can measure usability and experience based on 20 standardised questionnaires. WAMMI records and evaluates participants and visitor's satisfaction by comparing their answered choices against their expectations. The usage of WAMMI has been proven scientifically previously by many researchers and has a data rating between 0.90 to 0.93, which translates to a reliability analytics service.

Some of the netizens were selected randomly and explained the research. There were ten online encyclopedias chosen for this purpose. The responses would be completely anonymous, and the data would only be used for this research.

A total of 20 participants have participated in the WAMMI questionnaire evaluation method. Every participant has to browse all selected online encyclopedia before answering the given questionnaire. It reveals and shows the summary of the strongly dissatisfied, dissatisfied, fair, agree and strongly agrees with the websites' features. The questions were categorised into five factors, as illustrated in Table 7, and the questionnaire result is shown in Table 8.

Table 7. WAMMI Questions Categorization

Usability Category	Corresponding Questions
Category 1 Effectiveness	Q4 This website seems logical to me. Q9 This website helps me find what I am looking for. Q14 It is difficult to tell if this website has what I want. Q19 I get what I expect when I click on things on this website.
Category 2 Efficiency	Q3 I can quickly find what I want on this website. Q8 This website is too slow. Q13 I feel efficient when I'm using this website. Q16 This website has some annoying features.
Category 3 Engagement	Q1 This website has much that is of interest to me. Q6 The pages on this website are very attractive. Q11 I don't like using this website. Q18 Using this website is a waste of time.
Category 4 Error Tolerance	Q2 It is difficult to move around this website. Q7 I feel in control when I'm using this website. Q10 Learning to find my way around this website is a problem. Q17 Remembering where I am on this website is difficult.
Category 5 Ease of Learning	Q5 This website needs more introductory explanations. Q12 I can easily contact the people I want to on this website. Q15 Using this website for the first time is easy. Q20 Everything on this website is easy to understand.

TABLE 8. Results of Questionnaires Evaluation (in %)

Category	Strongly disagree	Disagree	Fair	Agree	Strongly agree
Effectiveness	0	15	35	40	10
Efficiency	5	15	15	50	15
Engagement	5	50	20	15	10
Error Tolerance	10	10	15	60	5
Ease of Learning	0	5	20	60	15

V. CONCLUSION

This study aims to evaluate the usability of a website to get the best optimisation of website performance. It measured and evaluated the online encyclopedia using the automated evaluation tools and questionnaire and compared various aspects when utilising the two methods. The results show that the website automated usability tools offer timesaving and suggest improving using several elements, performance, number of requests, time to load, size of the page, mobile, search engine optimisation, user experience and security. At the same time, the questionnaire method provides suggestion and evaluation based on user preferences. Combining both ways could help design and develop a website's better performance in terms of its usability.

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