

Website Performance Testing Using Speed Testing Model: A Case of Reputable Indonesian Journals

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ABSTRACT

The speed of a web journal to load pages reflects the website performance. It has influenced user satisfaction. This study aims to study and analyze the performance of journal websites in Indonesia that are accredited by SINTA 1 by the Ministry of Research and Technology of the Republic of Indonesia. This test uses parameters owned by GTmetrix tools and calculated using descriptive statistical methods. This research hypothesis regarding the reliability of website speed testing has been tested and confirmed based on experiments. The research involved 61 journal websites, which were taken from December 2019 to February 2020. 366 individual website speed tests from 6 test server region have done, and recommendations have been given on test results. The test result showed that parameter based on PageSpeed score provided the value of 7.9% (grades A to B) and 92.1% (grade C to F) and YSlow score provided a value of 2.5% (grade B) and 97.5% (C to F). The experimental results prove that the performance of the journal website is still a lot in the low category. With the recommendation, it was expected that the speed and responsiveness of the journal website would increase.

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1. INTRODUCTION (10 PT)

Website is an essential medium for accessing online journals. Website's slow speed will make users frustrated and angry. The results of the study on tolerance waiting time to load the website imply that the presence of feedback prolongs the tolerable waiting time for web users and the acceptable waiting time for the retrieval of information is about 2 seconds [1]. A sensitivity analysis suggests that reductions in results and behavioral intentions start to flatten when the delays extend to 4 seconds or longer, and attitudes flatten when the delays extend to 8 seconds or longer [2]. The study recommends web developers to calculate web page response time against threshold values like the 8 seconds rule when implementing a web page and to adapt defined techniques that minimize load time [3].

In Indonesia, the number of international reputable scientific journals as of January 2020 is 61. The journals in Indonesia are considered to have an international reputation for being indexed by Scopus and accredited by SINTA 1 by the Ministry of Research and Technology of the Republic of Indonesia [4]. The

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high-speed web site was needed to support it. So, to measure the speed, the homepage required. The researcher assumes that not all of the journal's website performs well.

Many types of research are studying of website speed measurement tools. The first research about website speed testing using GTmetrix indicates that the choice of location region significantly influences the website speed test results [5]. The second research found that there were still many college websites that had quite low performance.[6]. The third research about Load Runner and Apache Jmeter production indicate that Web applications experience poor scalability when they cannot handle a wide range of users [7]. The fourth research about GTmetrix showed that browser choice and location affect testing significantly on website loading speed. [8]. Based on the results of the study, this research was decided to use GTmetrix tools. This study aims to measure the performance of reputable journal websites in Indonesia indexed by SINTA 1 by the Ministry of Research and Technology of the Republic of Indonesia. Where all journals are indexed as Scopus and considered to have an international reputation

2. RESEARCH METHOD

This research framework shows in figure 1. The researcher can enter the site's URL into the column provided by GTmetrix to be analyzed and will get a performance report, including PageSpeed Score, YSlow Score, Fully Loaded Time, Total Page Size, and the number of requests you can get on your website. It should be noted that the results of each website speed test can vary. In choosing a website speed counter website, you should choose the one you like and keep using it.

Since February 2017, GTmetrix uses a method they call fully loaded time. According to them, fully loaded time is the point after on load events, and there is no network activity for 2 seconds. GTmetrix uses the same rules as Google PageSpeed Insight in providing value to your site. The rating you can get is between 0 to 100 (F to A). You will also get more than 25 recommendations. We will discuss some popular recommendations that are often obtained by website owners. If you follow the advice given by GTmetrix, you will see an increase in the loading time of your website [9].

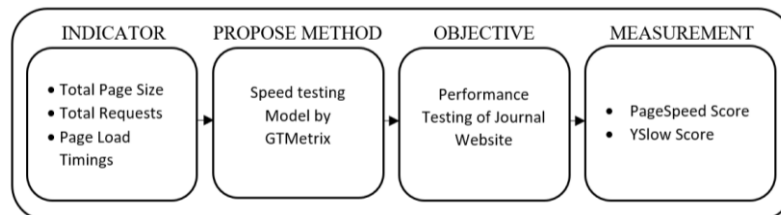


Figure 1. Research framework based GTmetrix model for website performance testing [9]

2.1. Hypotheses

This hypothesis role based on Indonesia journal was indexed in SINTA 1 last January 2020

- All most journal website used the Open Journal System (OJS)? [10]
- The OJS have better performance than others? [11]
- OJS version 2.x.x with responsive have better performance than unresponsive for mobile? [12]
- The OJS version 3.x.x has better performance than 2.x.x? [13]

2.2. Methodology for this research

This research methodology shows in figure 2. At the data collection stage, researchers took 61 SINTA 1 journals that were accredited by the Ministry of Research and Technology of the Republic of Indonesia last in December 2019. This study conducted 366 attempts from 6 different server locations. The server locations are in Vancouver Canada, Dallas USA, Mumbai India, Sydney Australia, Hong Kong China, and London UK. The stage of data pre-processing was taken from December 2019 to February 2020 and processed with MS Excel and SPSS. The method used is descriptive statistical analysis. The experiment was carried out using GTmetrix tools which produced five indicators including PageSpeed Score, YSlow Score, Fully Loaded Time, Total Page Size, and the number of requests. The data set that has been taken can be accessed on the following link https://drive.google.com/open?id=1RTUFmRkTdstU7xX5_Tx5jWYjFmamo9oB.

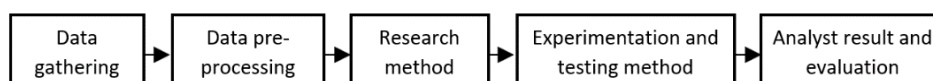


Figure 2. Research methodology

3. RESULTS AND ANALYSIS

This chapter provides a checklist of all SINTA 1 indexed web journals from six different server locations. Due to the limitations of the place of presentation, table 1 presents data only from Vancouver Canada servers. For data from five other servers, you can open the link in the methodology chapter.

Table 1. Performance report for journal SINTA 1 using server region Vancouver Canada from GTmetrix

No	Journal Name	Performance Report						Others			
		Page-Speed Score (%)	Yslow Score (%)	Load Time (s)	Page Size (MB)	Requ-ests	Platform	Versi-on	Mobile Respon-sive		
1	AGRIVITA, Journal of Agricultural Science	B	82	D	69	16.5	0.605	54	OJS	2.4.7.1	No
2	Atom Indonesia	F	39	E	54	6.9	1.27	80	OJS	2.4.4.1	No
3	Biodiversitas Journal of Biological Diversity	F	0	B	85	8.5	9.9	31	Custom	-	No
4	Critical Care and Shock	B	88	C	73	3.1	0.634	23	WordPress	-	Yes
5	The International Journal of Renewable Energy Development	F	36	E	51	14.7	3.46	143	OJS	2.4.8.1	Yes
6	Journal of the Indonesian Tropical Animal Agriculture	F	46	E	51	11.0	1.47	121	OJS	2.4.8.1	Yes
7	Journal on Mathematics Education	D	66	D	64	5.1	0.377	54	OJS	2.4.8.3	No
8	The Indonesian Journal of Science and Technology (IJoST)	F	24	E	58	20.1	3.52	107	OJS	2.4.8.5	No
9	Indonesian Journal of Applied Linguistics	F	38	E	58	31.0	0.968	71	OJS	2.4.8.5	No
10	International Journal on Advanced Science, Engineering and Information Technology	E	53	C	73	2.4	1.03	49	Joomla	-	No
11	International Journal of Electrical and Computer Engineering (IJECE)	E	59	E	52	1.6	0.508	55	OJS	2.4.7.1	No
12	International Journal of Advances in Intelligent Informatics	F	39	E	52	5.7	1.46	97	OJS	2.4.8.2	No
13	Bulletin of Chemical Reaction Engineering & Catalysis	F	37	F	47	12.8	3.06	142	OJS	2.4.8.1	Yes
14	Indonesian Aquaculture Journal (IAJ)	F	31	F	46	17.1	1.99	88	OJS	2.4.8.1	No
15	Indonesian Journal of Electrical Engineering and Computer Science	D	60	E	53	2.0	0.495	51	OJS	2.4.7.1	No
16	International Journal of Evaluation and Research in Education (IJERE)	C	70	D	61	6.6	0.360	52	OJS	2.4.7.1	No
17	International Journal of Technology (IJTech)	E	58	C	70	3.5	0.890	38	OJS	-	Yes
18	Indonesian Journal on Geoscience	F	49	E	59	6.2	1.27	44	OJS	2.3.8.0	No
19	International Journal of Power Electronics and Drive Systems (IJPEDS)	C	71	D	62	21.8	0.263	50	OJS	2.4.7.1	No
20	Indonesian Journal of Islam and Muslim Societies	D	61	D	61	18.4	0.607	81	OJS	2.4.8.5	No
21	Indonesian Journal of Pharmacy	F	29	E	56	10.1	2.15	109	OJS	2.4.4.1	No
22	The Indonesian Biomedical Journal	F	34	C	75	4.6	1.85	87	OJS	2.4.8.3	No
23	Journal of Degraded and Mining Lands Management	C	77	C	70	10.6	0.796	64	OJS	2.4.7.1	No
24	BIOTROPIA Journal	A	96	B	86	3.0	0.174	19	OJS	2.4.4.1	No
25	Journal of Indonesian Islam	E	50	E	52	5.7	0.98	76	OJS	2.4.3.0	No
26	Kesmas: National Public Health Journal	E	52	D	63	6.3	2.99	77	OJS	2.4.8.1	Yes
27	Bulletin of Electrical Engineering and Informatics	C	77	E	58	1.9	0.309	28	OJS	2.3.7.0	No
28	Operations and Supply Chain Management (OSCM)	C	74	D	65	6.0	0.861	78	WordPress	-	Yes
29	Tropical Animal Science Journal	B	88	D	67	6.2	0.527	34	OJS	3.1.2.4	Yes
30	Jurnal Manajemen Hutan Tropika	D	61	D	63	9.4	0.719	79	OJS	3.1.2.4	Yes
31	Hayati Journal of Biosciences	E	59	D	63	5.5	1.41	90	OJS	3.1.2.4	Yes
32	TELKOMNIKA (Telecommunication Computing Electronics and Control)	E	58	E	53	3.2	0.630	49	OJS	2.4.4.1	No

33	TEFLIN Journal	D	69	D	60	1.9	0.327	57	OJS	2.4.8.1	No
34	QIJIS (Qudus International Journal of Islamic Studies)	F	33	D	63	4.9	2.63	91	OJS	2.4.7.1	No
35	Studia Islamika	F	47	E	50	5.8	0.814	60	OJS	2.4.8.3	No
36	Forest and Society	D	66	D	65	4.5	0.358	67	OJS	2.4.8.0	No
37	Jurnal Pendidikan IPA Indonesia	D	65	D	61	17.2	0.884	56	OJS	2.4.8.3	Yes
38	Journal of Mathematical and Fundamental Sciences	D	60	E	50	6.1	0.477	56	OJS	2.4.2.0	No
39	Journal of Regional and City Planning	D	61	E	51	6.3	0.569	50	OJS	2.4.2.0	No
40	Jurnal Cakrawala Pendidikan	F	18	E	52	30.7	3.49	85	OJS	2.4.8.3	No
41	Paramita: Historical Studies Journal	F	46	D	60	24.9	3.43	102	OJS	2.4.8.3	Yes
42	Indonesian Journal of Biotechnology	F	0	D	62	12.9	5.73	74	OJS	2.4.8.1	No
43	Microbiology Indonesia	E	58	E	54	4.6	0.596	60	OJS	2.4.8.5	No
44	Journal of ICT Research and Applications	D	61	E	50	4.6	0.455	53	OJS	2.4.2.0	No
45	Journal of Engineering and Technological Sciences	D	60	E	50	4.5	0.462	54	OJS	2.4.2.0	No
46	Jurnal Ilmu Sosial dan Ilmu Politik	F	17	D	61	10.9	3.82	82	OJS	2.4.8.1	No
47	Indonesian Journal of Chemistry	D	60	D	61	25	0.613	66	OJS	2.4.8.1	No
48	Gadjah Mada International Journal of Business	E	56	E	59	6.1	1.24	47	OJS	2.4.8.1	Yes
49	KUKILA The Journal of Indonesia Ornithology	A	91	B	82	2.1	0.191	23	OJS	2.3.3.3	No
50	Indonesian Journal of Geography	D	63	D	61	11.8	0.483	67	OJS	2.4.8.1	No
51	Jurnal Respirologi Indonesia	C	77	D	66	3.6	0.611	60	OJS	2.4.8.3	No
52	Medical Journal of Indonesia	F	35	C	76	5.5	2.50	66	OJS	3.1.2.1	Yes
53	Wacana : Jurnal Ilmu Pengetahuan Budaya	D	64	D	61	4.2	0.652	56	OJS	2.4.4.1	No
54	Acta Medica Indonesiana	E	58	D	61	6.4	1.57	59	OJS	2.4.8.0	Yes
55	Indonesian Journal of Electrical Engineering and Informatics (JEEI)	C	74	E	58	6.5	0.384	33	OJS	2.3.7.0	No
56	Molekul	D	60	E	53	13.6	0.564	55	OJS	2.4.8.1	No
57	Electronic Journal of Graph Theory and Applications (EJGTA)	F	33	D	68	3.8	1.61	61	OJS	2.4.5.0	No
58	Bulletin of Monetary Economics and Banking	F	1	C	78	9.4	7.58	45	OJS	3.1.1.0	Yes
59	Squalen Bulletin of Marine and Fisheries Postharvest and Biotechnology	E	53	D	62	6.2	0.922	96	OJS	2.4.8.1	No
60	Al-Jami'ah: Journal of Islamic Studies	C	79	D	62	3.8	0.567	69	OJS	2.4.8.5	Yes
61	International Journal on Electrical Engineering and Informatics	F	6	C	77	25.0	5.25	15	Code Igniter	-	Yes

Table 2. Analysis Descriptive of Website of journal indexed in SINTA 1 based on the platform

Criteria	Platform	Minimum	Maximum
PageSpeed score	Code Igniter	6.00	58.00
	Custom	.00	.00
	Joomla	53.00	53.00
	Open Journal Systems	.00	96.00
	WordPress	74.00	88.00
Yslow score	Code Igniter	70.00	77.00
	Custom	85.00	85.00
	Joomla	73.00	73.00
	Open Journal Systems	7.00	86.00
	WordPress	65.00	73.00

Table 3. Analysis Descriptive of Website of journal indexed in SINTA 1 based on responsive for mobile

Criteria	Responsive for Mobile Device		OJS Version			
	Min.	Max.	Min.	Max.		
PageSpeed score	Responsive	36.00	79.00	OJS 2.x.x	.00	96.00
	Unresponsive	.00	96.00	OJS 3.x.x	.00	88.00
YSlow score	Responsive	45.00	66.00	OJS 2.x.x	24.00	86.00
	Unresponsive	24.00	86.00	OJS 3.x.x	7.00	78.00

Table 4. The summarized list of top recommendation

Priority	Area	Recommendation
1	Leverage browser caching	Make Ajax Cacheable, Add Expires or Cache-Control Header
2	Serve scaled images	Resized images in HTML or CSS
3	Optimize images	Optimize images to reduce their size
4	Enable compression	Enable compression for resources to reduce the transfer size
5	Inline small CSS	In lining the response in HTML can reduce blocking of page rendering

6	Enable Keep-Alive	The hosting must enable Keep-Alive
7	Minify JavaScript	Minify JavaScript to reduce their size
8	Inline small JavaScript	The external resources have small response bodies

In table 2 explaining the minimum and maximum values of PageSpeed and YSlow based on the type of platform, the results show that OJS is superior to Code Igniter, Custom, WordPress and Joomla. Table 3 explains about the responsive and unresponsive versions of OJS. Table 3 also describes the comparative assessment between OJS version 2.x.x and OJS version 3.x.x. OJS 2.x.x has better performance than OJS 3.x.x [13]. Table 4 is recommendation for users when they open a web page, your browser will load things like logos, CSS, JavaScript, etc. What the browser cache does is "remember" the resources of a web page that the browser has loaded. So, if a visitor opens another page, then the browser no longer needs to load the basic elements of your web page. This is what makes the first page load time longer than the load time when opening other pages from the same website. So, using the cache will speed up the load time of repeat visitors on your website. Also advised to the journal manager to reduce images with large sizes and pay attention to the level of image compression.

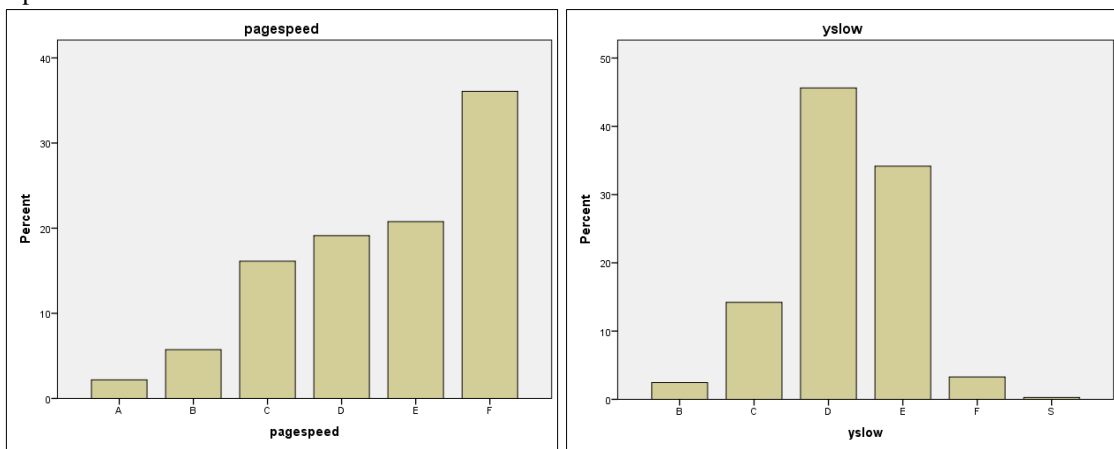


Figure 3. PageSpeed and YSlow Score based on GTmetrix for Journal indexed by SINTA 1

Figure 4. The best journal websites with PageSpeed (grade A) and YSlow (grade B) [14], [15]

Figure 3 is the result of experiments prove that most journal websites still have low category performance. Figure 4 is the best journal website that has the highest score of PageSpeed and YSlow. Both of journal is BIOTROPIA Journal, published by SEAMEO BIOTROP [14] and KUKILA The Journal of Indonesia Ornithology, published by Wildlife Conservation Society [15]. Both of the journals create by OJS 2.4.4.1 and 2.3.3.3 while the design was not responsive for mobile device and using a default template.

4. CONCLUSION (10 PT)

We have confirmed all the hypotheses tested. The following are the results

- a. All most journal website used the OJS platform, based on table 1 shows that 55 of 61 journal using OJS
- b. The OJS have better performance than others? Sure, based on PageSpeed and YSlow score in table 2 indicates that OJS has the highest value among the others
- c. Based on PageSpeed and YSlow score in table 3, proved that OJS version 2.x.x with unresponsive has better performance than OJS version 2.x.x with responsive for mobile
- d. The OJS version 3.x.x has better performance than 2.x.x? Sure, based on PageSpeed and YSlow score in table 3 proved that OJS version 2.x.x has better performance than OJS version 3.x.x

Figure 3 shows the results of the GTmetrix test based on PageSpeed and YSlow scores indicate the journal website has a low return. The most straightforward recommendation for journal managers is to use the default OJS template without many images and design modifications like two journals in figure 4.

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