

Performance measurement implementation on the smart fisheries village website using pagespeed insight

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Article Info

Article history:

Received May 2, 2024

Revised June 11, 2024

Accepted June 14, 2024

Keywords:

Smart fisheries village (SFV) website

Website performance measurement

PageSpeed

Insight

ABSTRACT

Websites have become the primary way organizations and individuals to communicate, provide information, and offer daily services. The purpose of creating the Smart Fisheries Village (SFV) website was to enhance the performance and quality of the user experience by measuring and optimizing image sizes using Google's tools, specifically Google PageSpeed Insight. We monitored and analyzed the implementation performance to ensure faster loading times without compromising visual quality. The implementation results showed significant improvements in the SFV loading speed, leading to a more satisfactory user experience. To identify images that slow website loading, we used data from PageSpeed Insight. After implementing improvements, we distributed a questionnaire to users to evaluate the development results. The results of the questionnaire revealed a significant increase in user satisfaction with the loading speed and quality of the user experience of the Bangsring Smart Fisheries Village (SFV) website. These findings provide valuable information for the continued development and optimization of website performance in the future. Therefore, this research makes a valuable contribution to improving the performance and user experience of the Bangsring Smart Fisheries Village (SFV) website.

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<https://doi.org/10.52465/joscecx.v5i2.363>

1. INTRODUCTION

The Bangsring Smart Fisheries Village (SFV) website program is an initiative of the Ministry of Marine Affairs and Fisheries (MMAF) that utilizes a fisheries area with flagship commodities to develop an integrated fishing village. This is achieved by synergizing research and technology with human resource development, providing information about Bangsring's food, history and tourist attractions [1] [2]. The challenge lies in enhancing the performance, speed, image loading, and accessibility of the SFV website for users. This is crucial because the success of a website depends on visitors accessing it and pages loading quickly. Therefore, visitors should be satisfied with obtaining the desired information without significant delays. Websites with prolonged loading times tend to be abandoned by users [3] [4] [5].

The speed of loading and user experience are crucial aspects due to the evolving behavior of internet users, which increasingly demands fast access and satisfying experiences, necessitating continuous

optimization of website performance [6]. Therefore, this research is carried out to improve the performance and quality of the user experience on the Smart Fisheries Village (SFV) website, focusing on optimizing image sizes as one of the key factors that influence loading speed. This research is based on understanding of the importance of information technology in the context of website development and management. Previous studies have highlighted the importance of optimizing website performance to improve user satisfaction and online communication effectiveness. For example, in a study [7], Website Performance Measurement was carried out on the Toko Kerja Website, which utilized testing tools such as PageSpeed Insight.

According to Stefanie Yason's research [8] titled "Performance Analysis of the SCLEAN Website using Pingdom Tools and PageSpeed Insight," testing with Pingdom Tools and PageSpeed Insight provides information and data on the performance of the SCLEAN Website to address software issues. Data collected from the testing results can be analyzed to assess speed and performance aspects using these performance testing applications. In Heidi Angela Tengriano's study titled "Performance Analysis of AyoMulai Website using GTMetrix and PageSpeed Insight," it is stated that website performance is a primary factor in ensuring user comfort. Therefore, before introducing the AyoMulai website, a performance analysis is necessary to identify the performance and any shortcomings that need to be addressed to improve the website [9].

Additionally, the impact of image size affects application speed, as cited in Asri Putri Dwi Gita Andini's research titled "Analysis and Improvement of Website-Based Application Performance Using Gtmetrix Stress Tools" [10]. Furthermore, Dewi Laksmiati's study titled "Testing Website Performance Optimization using CloudFlare with Stress Test Method" states that the increasing speed of the Internet and the growing number of internet users also contribute to increased website visits. To prevent this, website optimization is crucial to ensure that multiple users can access it comfortably simultaneously without access delays [11].

In measuring the performance of the Smart Fisheries Village (SFV) Bangsring website, the author used Google PageSpeed Insight tools as a reference for evaluating the website's performance. PageSpeed Insight is a Google-developed website performance testing tool that measures the loading speed of a website and provides recommendations on the loading speed when accessed via mobile or desktop devices, accessible through the link '<https://pagespeed.web.dev/>' [12] [13]. The steps involved in the testing process of the Smart Fisheries Village Bangsring website include opening the PageSpeed Insight website at the URL '<https://pagespeed.web.dev/>', which then displays the analysis results. The results of the analysis obtained from PageSpeed Insight are presented in percentage scores. After analyzing the implementation of improvements, the author distributed a questionnaire consisting of 5 questions to users to measure their satisfaction level in accessing the SFV website using the Likert Scale method, followed by 20 respondents. On the Likert scale, there are 5 answer categories: strongly agree, agree, neutral, disagree, and strongly disagree [14]. The Likert scale is a psychometric scale commonly used in questionnaires and most commonly used in survey research [15]. The results of the questionnaire show a significant improvement in user satisfaction with the loading speed and user experience quality of the Bangsring Smart Fisheries Village (SFV) website.

The expected result of this research is a significant improvement in the loading speed of the SFV website and the creation of a more satisfying user experience. Through a detailed analysis of factors affecting website performance, this research aims to provide valuable information for the future development and optimization. Thus, this research is relevant in the effort to improve the user experience and the quality of services provided through the Smart Fisheries Village website.

2. METHOD

Research Stages

In the research process, the first step is to analyze the performance of the Smart Fisheries Village website using Google PageSpeed Insight. If the analysis and performance testing of the Smart Fisheries Village website are not optimal, then performance improvements are implemented. After implementing the improvements, another analysis and performance testing of the Smart Fisheries Village website is performed to ensure whether the performance has become optimal or not. If it is still not optimal, the process repeats; if it becomes optimal, then a survey is conducted to obtain user satisfaction responses regarding the user experience. If user responses are still not optimal, further testing and user experience surveys are conducted again. If not, then the research concludes.

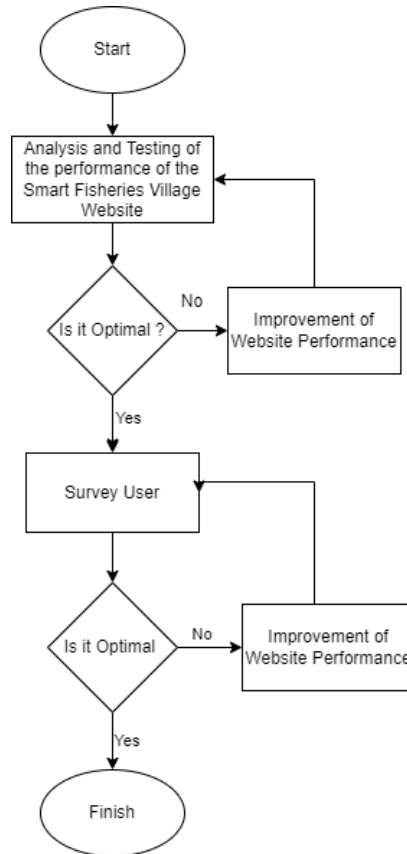


Figure 1. Research flow

Steps to test the performance of the Smart Fisheries Village Website using PageSpeed Insight:

- 1) Open the Google Chrome browser.
- 2) Access the link '/pagespeed.web.dev/'.
- 3) Enter the address of the website to be analyzed.
- 4) Read the analysis results provided by PageSpeed Insight.
- 5) Perform image optimization on the website.

Data Type

In this website performance research, quantitative data is utilized since the research data consists of numerical values [16], using data from the analysis results of Google PageSpeed Insight tools, such as website performance scores measured on a percentage scale and website loading time measured in time units. Additionally, image data, such as oversized image dimensions and images in JPG/JPEG (Joint Photographic Experts Group) and PNG (Portable Network Graphics) formats, are converted into Webp format (Web Picture Format).

Data Source

Primary data

The Author's primary data is directly obtained from the analysis results using Google PageSpeed Insight. This primary data includes the website performance score in percentage form and the time required to load the website pages in time units. These data are generated directly from the Bangsring testing conducted on the Smart Fisheries Village (SFV) website using the PageSpeed Insight analysis tool. In these primary data, the author obtains information that influences the website performance score and the loading time of website pages, specifically related to images of Culinary, D'Ocean and Mutiara Pulau Tabuhan Bangsring, each sized 200KB, with an internet access speed of 11.5 Mbps download and 11.7 Mbps upload.



Figure 2. Examples of images that need optimization

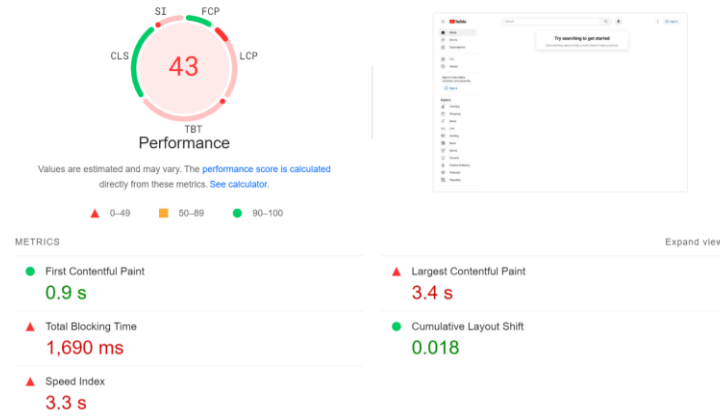


Figure 3. Example of analysis results using PageSpeed Insight

Respondent data

The author expands the scope of the research to include user perceptions or experiences regarding the performance of SFV Bangsring. In this regard, the author can develop a questionnaire aimed at gathering responses from users about their satisfaction with the performance of the SFV Bangsring website and their overall experience when accessing the SFV website in the form of a Likert scale questionnaire. Then, the results of the questionnaire can be used as additional data sources to support the analysis of the SFV Bangsring website. In other words, user feedback can help to better understand how users perceive or experience interactions with the Bangsring Smart Fisheries Village (SFV) website.

In the survey phase, the author conducted a survey on the results of the analysis and performance tests of the Smart Fisheries Village website using the Likert scale. In this discussion, the author created 5 questions for 20 users related to the developments made by the author. These 20 users were between 18 and 45 years, representing the age range of potential users of the website.

Here are examples of questions in the questionnaire:

- 1) How satisfied are you with the performance of the SFV website?
- 2) How fast is the display of images?
- 3) Do the images look good on the device you are using?
- 4) Are the size and resolution of the images suitable for your needs?
- 5) Are the images on the website clear and sharp?

For the determination of the percentage and weight values used for each question to be assessed, the following are examples of weight value tables in Table 1.1 and percentage tables in Table 1.2 [17].

Table 1. Weight Values

| Answer | Value |
|--------|-------|
| SS | 5 |
| S | 4 |
| N | 3 |
| TS | 2 |
| TSS | 1 |

Table 2. Percentage value

| Answer | Explanation |
|--------------|-----------------------------------------|
| 0% - 19.99% | Very (not agree, Bad, atau Very little) |
| 20% - 39.99% | Not agree or Not good |
| 40% - 59.99% | Enough or Neutral |
| 60% - 79.99% | Agree, Good, atau Like |

80% - 100% Very (agree, good, like)

Questionnaire calculation process

In the questionnaire calculation process, the author obtained data from the questionnaire responses and then proceeded to calculate the questionnaire data using the following formula [18] :

$$P = \left(\frac{F}{N}\right) * 100\% \tag{1}$$

Explanation :

- P = percentage (%)
- F = searched frequency
- N = number of respondents

3. RESULTS AND DISCUSSIONS

Testing Using PageSpeed Insight

Testing using the PageSpeed Insight tool is by inserting a link from SFV Bangsring into the home page via 'https://pagespeed.web.dev/'. Then PageSpeed Insight will analyze the performance of the SFV Bangsring website. Then PageSpeed Insight will display a performance value of 0-100 from the performance of the Smart Fisheries Village (SFV) website. The performance value is based on several factors, namely page load time, content size, cache usage, and image optimization.

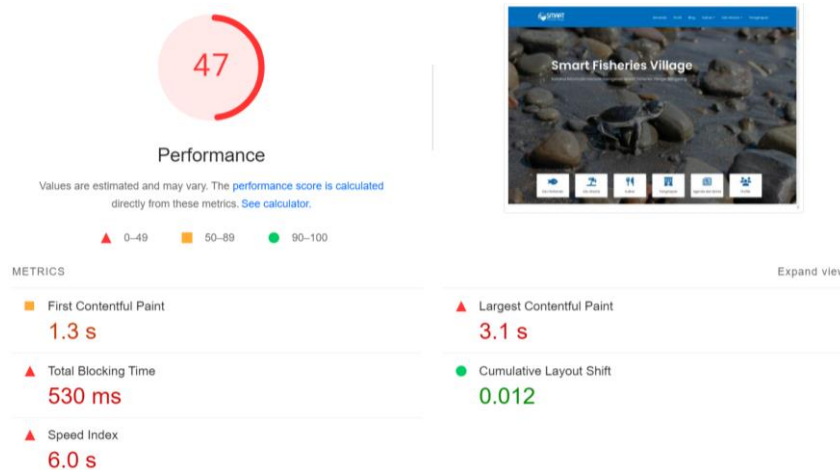


Figure 4. PageSpeed insight analysis results

PageSpeed Insight uses a red triangle indicating poor quality for grades 0-49, a yellow square indicating quite good quality for grades 50-89, and a green circle indicating very good quality for grades 90-100. The test in Figure 2 got a score of 54, which shows that the Smart Fisheries Village (SFV) website has poor performance.

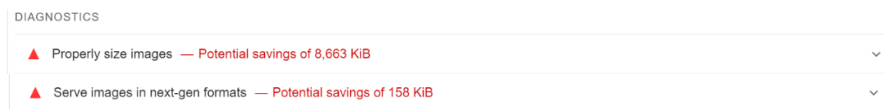


Figure 5. Google pagespeed improvement suggestions

When the results show a red triangle, it means that PageSpeed Insight recommends improvements so that website performance gets a better score.

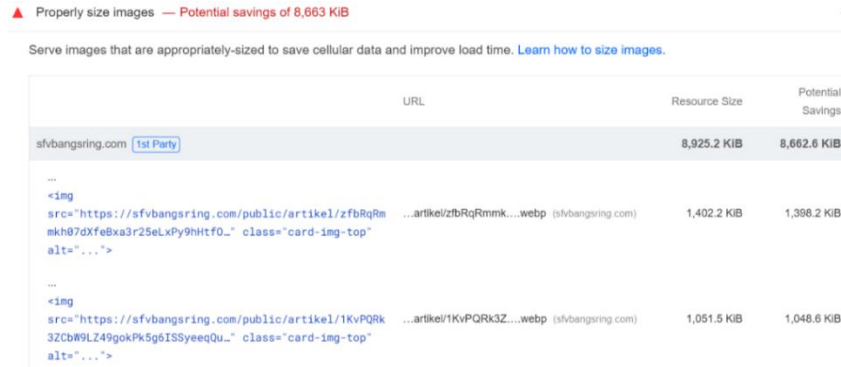


Figure 6. Improvement suggestions properly size images on Google pagespeed



Figure 7. Improvement suggestion to serve images in next-generation formats

Properly size images

Based on the suggestions from PageSpeed Insight in Figure 5, it recommends reducing the image size because the image size is too large, causing the website's image loading to be somewhat slow. This is achieved by reducing the image size to 70% to 80% of its original size. The suggested images to be resized have been saved by the author in the initial photo link, so resizing is done for content needs. According to suggestions from the platform <https://Foregroundweb.com/>, visible artifacts only appear when the quality is reduced below 50-60% due to high file compression. However, between 100 and 70% - 80% quality, the difference in quality is less noticeable, while the difference in image file size is significant. In this study, the author used a 30% reduction in image size to ensure that images maintained 70% of their original quality. At 70% image quality, it still provides good image quality and smaller file sizes, thereby reducing the time required to load web pages. To resize the images, the author used [imageresizer](https://imageresizer.com/) accessible through the link <https://imageresizer.com/>.

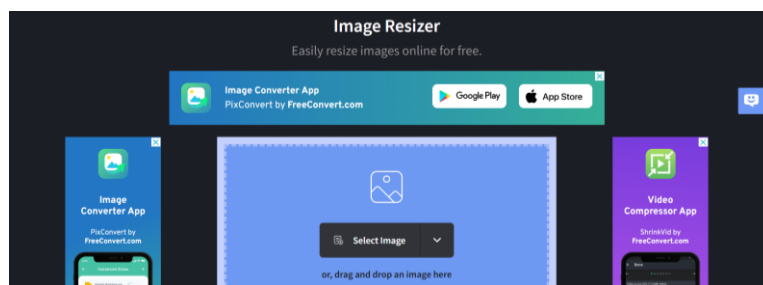


Figure 8. Website image resizer

In Figure 8, the author uploaded the image to reduce its size using an image resizer. After the image was successfully uploaded, the researcher resized the image using the percentage mode to reduce the image size to 70% of its original size. Figure 9 shows the image resizing process, after finding the appropriate size, the author clicked "Resize Image" and the resulting image was saved.

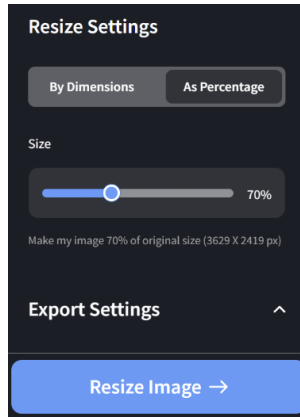


Figure 9. Image resizing process

After resizing the images by reducing their size to 70% of the original size, the results of resizing the image will be saved in the photo link after resizing.

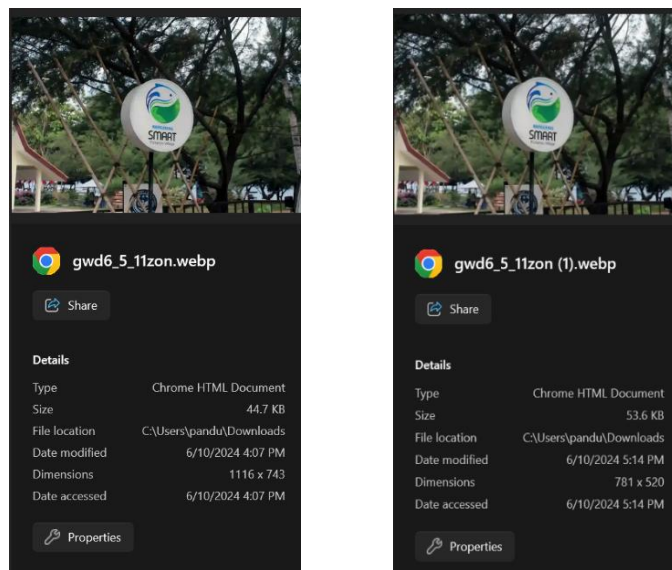


Figure 10. Photo before resizing and after resizing

Figure 10 shows a photo before and after resizing to 30% of its original size. The photo before resizing has a size of 44.7 KB and dimensions of 1116 x 743, while the photo after resizing has a size of 53.6 KB and dimensions of 781 x 520. And then uploaded through the admin page. To upload photos to the admin page, one must first log in to the SFV Bangsring website, which can be accessed through the admin page using the following link: <https://sfvbangsring.com/zxcv>.



Figure 11. Admin page display

Figure 11 is the display of the SFV admin page. After entering the link, the author will input the Email and password to access the SFV Website admin page.

Figure 12. Process of uploading photos after resizing

Then, the next step is to change the format of the previously resized photos. The method used to change the format of the resized photos is by clicking the Choose File button, as shown in Figure 12, then selecting the resized photo file and clicking the Save button. After resizing the images on the admin page, the website underwent another performance test using Google PageSpeed Insight. Based on the results of the SFV Website using Google PageSpeed Insight in Figure 13, the website performance speed, which previously received a score of 47, improved to 59, indicating fair performance.

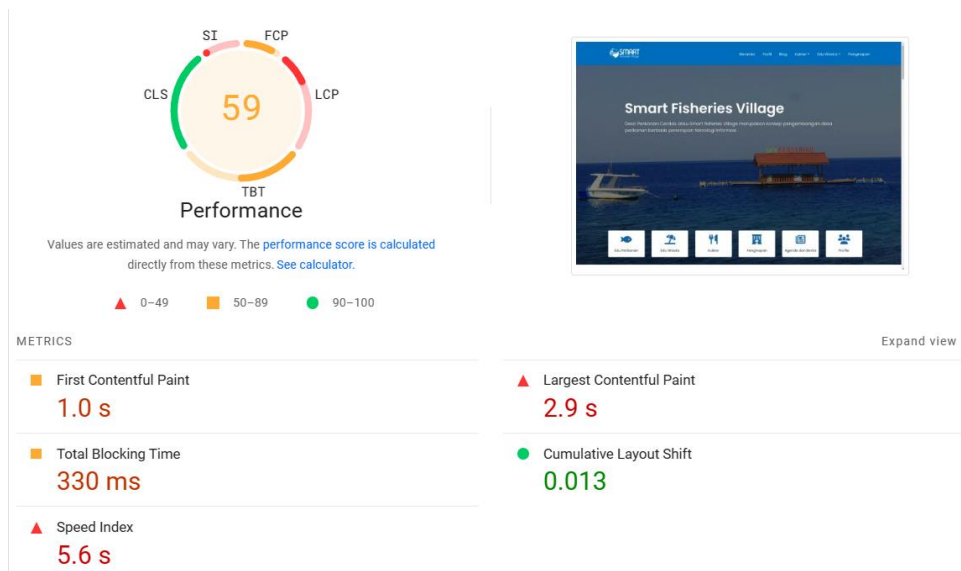


Figure 13. Google page speed insight performance test

Serve images in next-generation formats

Based on Google PageSpeed Insight's suggestion in image 7 to use the Next-Gen format, the initial image that the author used can be accessed on the Photo link Resize in JPG/JPEG and PNG format will now be converted to Webp format. Webp is an image format developed by Google to accelerate website page loading with smaller file sizes while maintaining image quality. This is feasible because image formats such as JPG/JPEG and PNG are considered outdated and should be replaced with [19]. The author utilizes Convertio to convert images to Webp, accessible through the link <https://convertio.co/id/>.



Figure 14. Display after uploading an image file to convertio

Figure 14 shows the image after you upload your image file. After the file is successfully uploaded, the researcher clicks on "Convert" and waits for the conversion to complete. After the image file is successfully converted to WebP, the image file will be downloaded. Figure 15 shows that the image file has been successfully converted and is ready for download.

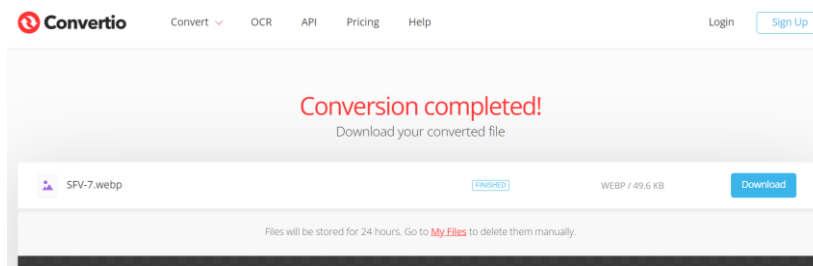


Figure 15. Display files ready for download

In Figure 7, Google PageSpeed Insight suggests using images in next-generation formats. All image formats that do not use the Webp format will be replaced with Webp format images, which the author will save on the Webp photo link. Figure 16 shows the source code of the SFV website that has been optimized into Webp format as suggested by PageSpeed Insight.

```

</div>

<!-- footer about end -->

<!-- Kosong-->
<div id="histats_counter" class="d.none" style="display:none;"></div>
<div class="col-md-4 col-sm-12 text-center align-self-end p-5">
  
</div>
<!-- Kosong -->

<!-- footer about-->

<div class="col-md-4 col-sm-12">
  <div class="footer-about_img mb-4 text-white ">
    
  <p>
    Pantai Bangsring, Bangsring, Kec.
    Wongsorejo,
    Kabupaten Banyuwangi, Jawa Timur 68453
  </p>

```

Figure 16. Source code menggunakan format webp

Google PageSpeed Insight Analysis Results

After the Smart Fisheries Village (SFV) website has been improved based on the analysis from Google PageSpeed Insight, the Author will retest the performance of the SFV website to determine the comparison of performance scores before and after the improvements. Figure 4, shows the analysis results before the improvements were made according to Google PageSpeed Insight, with a score of 47 indicating that the website (SFV) had poor performance. Figure 17, shows the analysis results after the improvements were made based on Google PageSpeed Insight, with a score of 63 indicating that the website (SFV) had a fairly good performance.

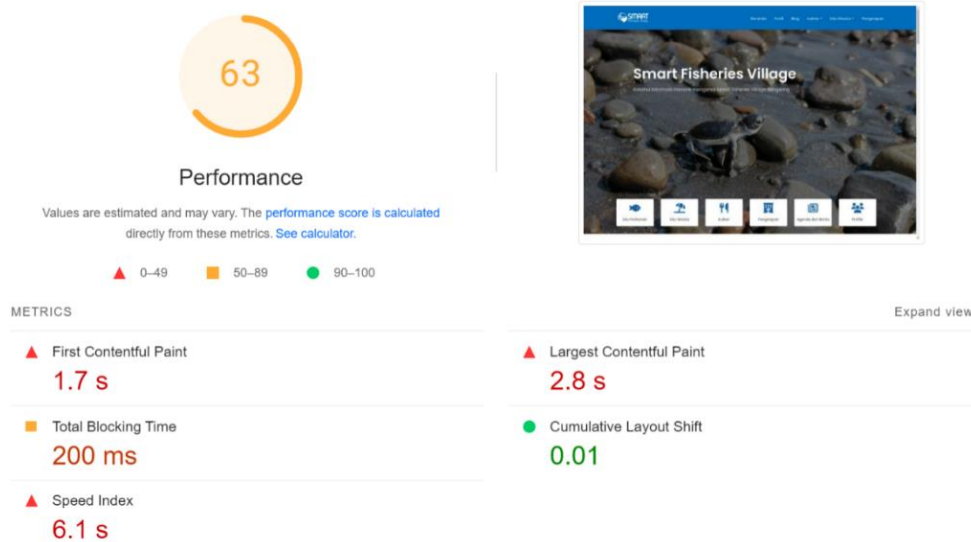


Figure 17. Google PageSpeed Insight analysis results after repair

Questionnaire Calculation

After knowing the performance of the SFV website from the results of Google PageSpeed Insight analysis, the author used a questionnaire aimed at collecting user responses regarding user satisfaction with the performance of SFV Bangsring and the overall user experience when accessing the SFV Website, using a questionnaire with a Likert scale. Then the results of the questionnaire can be used as an additional data source to support the analysis of the SFV Bangsring website.

Questionnaire Calculation Process

From the questionnaire data obtained, it will then be calculated using the following formula.

$$P = \left(\frac{F}{N}\right) * 100\% \tag{2}$$

Explanation :

- P = percentage (%)
- F = searched frequency
- N = number of respondents

With 5 questions in the questionnaire with a total of 20 respondents, they are:

- 1) Question: What is your level of satisfaction with the performance of the SFV Website?
- 2) Results of answers from 20 respondents:
 - a) Respondents who answered "strongly agree" (TS) = 7
 - b) Respondents who answered "agree" (S) = 10
 - c) Respondents who answered "neutral" (N) = 1
 - d) Respondents who answered "disagree" (TS) = 2
 - e) Respondents who answered "strongly disagree" (TSS) = 0
- 3) Calculation of total score or frequency (F)
 - a) Total strongly agree (SS) = 7(5) = 35
 - b) Total agree (S) = 10(4) = 40
 - c) Total neutral (N) = 1(3) = 3
 - d) Total disagree (TS) = 2(2) = 4
 - e) Total strongly disagree (TSS) = 0(1) = 0
 - Total = 82
- 4) Percentage calculation:

To obtain interpretation results, it is necessary to first know the number of respondents based on the highest and lowest scores for the assessment as follows [20] :

Highest Likert score x number of respondents 5 x 20 = 100
 Lowest Likert score x number of respondents 1 x 20 = 20

$$\begin{aligned}
 P &= \left(\frac{F}{N}\right) * 100\% \\
 &= \left(\frac{82}{100}\right) * 100\% \\
 &= 82\%
 \end{aligned}$$

From the research results, it was found that 82% of users are very satisfied with the performance of the website. Several criteria were used to measure respondents' satisfaction, including satisfaction with the performance of the SFV website, the speed of displaying images, and other criteria such as the appropriateness of image size and resolution, and the clarity and sharpness of images on the website across different devices.

Decision-Making Calculations

To obtain the decision-making calculation results, the percentage of answers generated from the 5 existing questions will be included in the calculation using the following formula:

$$P = \left(\frac{F}{N}\right) * 100\% \quad (3)$$

Explanation :

- P = percentage (%)
- F = searched frequency
- N = number of respondents

The results of 5 questions on the questionnaire with 20 respondents are summarized as follows:

- 1) Research Analysis: Is the measurement of the website's image performance beneficial?
- 2) The results of the analysis of five questions are as follows:
 - a) Respondents who answered 'strongly agree' (SS) = 1
 - b) Respondents who answered 'agree' (S) = 2
 - c) Respondents who answered 'neutral' (N) = 1
 - d) Respondents who answered 'disagree' (TS) = 1
 - e) Respondents who answered 'strongly disagree' (TSS) = 0
- 3) Calculation of the total score or frequency sought (F)
 - a) Total strongly agree (SS): 1 x 5
 - b) Total agreeance (S): 2 x 4 = 8
 - c) Total neutral (N): 1 x 3
 - d) Total disagree (TS): 1 x 2
 - e) Total strongly disagree (TSS): 0 x 1 = 0 +
 - f) Total = 18

Percentage Calculation

To obtain interpretation results, it is necessary to know the number of respondents based on the highest and lowest scores for assessment as follows:

The highest Likert score x the number of respondents 5 x 5 = 25

Lowest Likert score x number of respondents 1 x 5

Below is the assessment of respondent interpretations based on the highest score on the satisfaction level towards our website's performance:

$$\begin{aligned}
 P &= \left(\frac{F}{N}\right) * 100\% \\
 &= \left(\frac{18}{25}\right) * 100\% \\
 &= 72\%
 \end{aligned}$$

Based on the percentage table and the percentage results available, 72% of the total respondents believe that measuring image performance on the website can provide benefits.

4. CONCLUSION

The performance analysis of the SFV Bangsring website, using Google PageSpeed Insights and a user satisfaction questionnaire, reveals high user satisfaction. The questionnaire, which used a Likert scale, showed that 82% of respondents were very satisfied with the website's performance, particularly in terms of speed, image display, and clarity across different devices.

Additionally, the analysis highlights the importance of continuous monitoring and improving website performance. With 72% of the respondents stating that measuring image performance on the website is beneficial, it emphasizes that technical aspects such as loading speed and image quality should be prioritized in web development. Practical implementations of these findings could include regular optimization routines using tools such as Google PageSpeed Insights, as well as collecting user feedback through questionnaires to identify areas needing improvement. The data shows that the majority of users are very satisfied with the website's performance and acknowledge the benefits of measuring image performance, confirming the success of the optimization strategies implemented. In this way, SFV Bangsring can continuously improve user experience and maintain a high level of satisfaction.

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