# Analysis and Implementation Heuristic Evaluation Method and Code Refactoring Method on Website of Sribaduga Museum

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## ABSTRACT

User experience, user interface, and standard programming code is the quality factor for a variety of systems, one of them is a website. Interface assessment evaluation and implementation of standards for programming code are made to meet the quality factor. Evaluation using heuristic evaluation methods used to assess the interface and code refactoring methods for validation standard programming code. The utilization of these methods are proven to improve the level of user satisfaction to interface websites, and website developer to standard programming code.

**Kata kunci :** Usability, User Experience, User Interface, Website, Code Refactoring.

## 1. INTRODUCTION

Interactive web sites and flexible depending on several factors including the quality of the user interface, user experience, and standard programming code structures. According to the results of initial studies conducted there were 59.83% of the 30 correspondents complained of in terms of user interface design website that seem dark and dull. At the user in terms of user experience, there are 73.13% of the 30 correspondents complained when the respondents access the website through mobile devices.

Standard programming code structures are applied affects the quality of existing programming code. According to the results of survey of the news page on the website of Sri Baduga museum, obtained results validation of the HTML programming language, there are errors totaled 138 errors and 4 warnings [1]. In the CSS programming languages there are the result of the validation, amounting to 67 errors and 115 warnings [2]. On JavaScript and PHP programming languages there are errors to writing programming code that is not standardized by the standards recommended by the Google code [3] and CodeIgniter [4].

The evaluation will be conducted to measure the extent to which visitors and website development team musuem Sri Baduga have the benefit of the application user experience, user interface, and standard programming code. In this research will use Heuristic Evaluation method and Refactoring Code method. Heuristic Evaluation method is a method to measure and reveal the problems at the interface of website [5], whereas the method of Code Refactoring is the process of restructuring the existing programming code without changing the behavior of the programming code.

Standard programming code for HTML, CSS and JavaScript will be using standard programming from Google [3] [6]. Selection of these standards are based on reason encouragement Google to users of standard guidelines, for simplify each size bytes existing programming code [7]. As well as the advantages of Goolge JavaScript style guide, JavaScript programming code divided to two focus. The first is JavaScript Language Rules and the second is JavaScript Style Rules. In addition guide style recommendations, it has been recommended by several well-known web sites such as Smashing Magazine [8] and JavaScript: The Right Way [9]. Standard programming for PHP code using a standard programming of CodeIgniter [4]. Selection of these standards are based on reason advantages in providing clear guidance between programming code recommended or not recommended [10].

### 1.1 Heuristic Evaluation Method

Heuristic evaluation method is defined according to Jakob Nielsen [5] is a method for finding usability problems in user interface design, so the method can be used as part of the design iteration process. Meanwhile, according to www.usabilitynet.org [11] heuristic evaluation method is defined as follows, heuristic evaluation method is a form of usability inspection where usability specialists judge whether each element of the user interface are set to follow a list of usability heuristics. Here is a heuristic principle used in this research, the principle of heuristic evaluation method used is based on the principle by Dr. David Travis [12]:

1) Home Page

Home page is the face of the organization to the world and the point where the user decides to interact with the organization. Needs to be a balance between showing the various items offered and simplify the content to ensure that the majority of customers can easily launch the most common tasks.

2) Navigation & IA

Navigation and information architecture are the components of web pages that support the user in finding information and in browsing through the site's content. A well designed navigation system is more than a good taxonomy: it encourages customers to explore parts of the site they may otherwise have missed.

3) Trust & Credibility

A site has credibility when customers trust the content and the organisation behind it. This is critical in forming customers' opinions of the brand.

4) Writing & Content Quality

Writing for the web is not the same as writing for print: people read differently on the web and expect to scan content pages for information.

5) Page Layout & Visual Design

The checkpoints in this area ask if the dialogue is aesthetic and minimalist. Appropriate visual design means that the fonts, icons, colours and layout help the customer complete common tasks and that pages do not contain information that is irrelevant or rarely needed.

6) Search

Search is one of the dominant ways that many customers interact with web sites. A good search engine needs to acknowledge the 'human' side of searching, which means dealing with spelling errors and synonyms (such as 'laptop' for 'notebook'). Google has set the standard for how search should look and behave, and many of these guidelines are based on this best practice.

7) Help, Feedback & Error Tolerance

These guidelines help assess if the site helps prevent customers from making errors. A site is error-tolerant if, despite evident errors in input, the intended result may be achieved with either no or minimal corrective action by the customer.

**1.2 Stages Processing Standards Heuristic Evaluation**

In this study will be used standard methods Heuristic Evaluation process to resolve the issue on the user interface and user experience on website of Sri Baduga museum. Here are five stages in the process of heuristic evaluation standards [5]:

1) Plan The Evaluation

At this stage, researchers are required to establish the purpose of the study and then communicated to the evaluator to prepare for the next stage.

2) Choose Your Evaluators

At this stage, researchers must select evaluators who will be included in the study. The evaluators may consist of usability specialist circles, fellow programmer, and potential internet users. For the usability specialist it becomes optional, as is generally the usability specialist will assign a certain price to conducting research. Where possible, it is better to use the services of the usability specialist, because the survey results obtained will be more accurate.

3) Brief The Evaluators

At this stage, researchers will give a brief explanation to prospective evaluators about heuristic evaluation method. The evaluators will be given guidelines for assessment in the form of a set of questions about the usability of web sites.

4) Pelaksanaan Evaluasi (Conduct The Evaluation)

On this stage, researchers each evaluators will begin to evaluate a website using a scoring guide that refers to methods of heuristic evaluation.

5) Analisa Hasil Evaluasi (Analyze The Results)

At this stage the researcher will do an analysis of the results of observations conducted by the evaluators on the web site. The result will be a recommendation that will bebeneficial to the development of the web site

**1.3 Web Coding Standards**

Standard Programming Code is intended to be the basis of a website. A foundation to the World Wide Web, and then the browser and various software can be understood in a repertory same basis [13]. In this study using several standards in coding, coding standard is intended to equalize opinion amongst website developers.

Standard programming code in this penelititan using three standard guide the programming code:

1) CodeIgniter Style Guide [4].

CodeIgniter standard programming code is used as the standard programming code scripting language Hypertext Preprocessor (PHP).

2) Google HTML/CSS Style Guide [6].

Google's standard manual programming code is used as a standard hypertext markup language (HTML) and cascading style sheets (CSS).

3) Google JavaScript Style Guide [3].

Google's standard manual programming code is used as a standard dynamic programming code JavaScript.

**1.4 PSSUQ (Post-Study System Usability Questionnaire)**

PSSUQ (Post-Study System Usability Questionnaire) is a questionnaire package containing as much as 16 to 19 questions. The questionnaire package has the objective to assess the satisfaction of users of the system being tested [14]. Measurement values used using a Likert scale is 1 to 7, a value of 1 to stated strongly disagree and 7 to express the values strongly agree. Below is a table that presents one Likert scale used.

Table 1 Likert Scale

| Score | Description |
|---|---|
| 1 | Strongly disagree |
| 2 | Disagree |
| 3 | Somewhat disagree |
| 4 | Doubtful |
| 5 | Somewhat agree |
| 6 | Agree |
| 7 | Strongly agree |

1) Questionnaire Package

Here is a questionnaire package PSSUQ (Post-Study System Usability Questionnaire) which will be used:

1. Overall, I am satisfied with how easy it is to use this web.
2. Web easy to use
3. I can complete the tasks and scenarios using this web
4. I feel comfortable using this web application.
5. The Web Application is easy to learn
6. I believe in a short time can be productive by using this web.
7. Web gives an error message / error that tells me how to fix the error.
8. When I made a mistake using this web easily and quickly I can get back to the normal web.
9. Information on this website is presented clearly.
10. I can easily find the desired information
11. The information presented can effectively help complete the tasks and scenarios used in this web application
12. Organization of the information displayed on the screen, presented clearly.
13. The interface is presented feels comfortable and enjoyable.
14. I like to use this web interface.
15. The website has a function and capability that I expect.
16. Overall, I am satisfied using this web.

2) Scoring System

Questionnaire package will first be tested to respondents, then we will get results in a value between 1 and 7. The results of the raw value, then the questions contained in the questionnaire will be divided into four sub-scale as shown in the following table.

Table 2 Sub Scale PSSUQ

| Sub Scale | Average Items |
|---|---|
| Overall | Question number 1 s/d 16 |
| System Quality | Question number 1 s/d 6 |
| Information Quality | Question number 7 s/d 12 |
| Interface Quality | Question number 13 s/d 16 |

**1.5 Measurement Tools**

Measurement tool is used as a validation web sites. Utilization of this measuring device to measure whether website has a valid source programming code, and error checking. In addition the use of online tools as a comparison between the performance of the original web sites of Sri Baduga museum with the web site results of research development.

This measurement tool is available online and offline, and the gauges is a test tool that has been tested and can be accounted for. Here is a test devices used are presented in Table 3:

Table 3 Measurement Tools

| Factor | Measurement Tools |
|---|---|
| Valid Code | http://validator.w3.org/ |
| | http://jigsaw.w3.org/css-validator/ |
| | SublimeLint-JSCS (http://jscs.info/) |
| | PHP CodeSniffer (https://github.com/squizlabs/PHP_CodeSniffer, https://github.com/thomas-ernest/CodeIgniter-for-PHP_CodeSniffer) |

Tabel 4 Total Value Of Heuristics Principles

| Evaluator | Hasil Total Nilai Dari Prinsip Heuristik (%) | | | | | | | Rata-rata (%) |
|---|---|---|---|---|---|---|---|---|
| | P1 | P2 | P3 | P4 | P5 | P6 | P7 | |
| E1 | 90 | 78 | 73 | 88 | 60 | 56 | 44 | 70 |
| E2 | 90 | 84 | 82 | 85 | 85 | 67 | 56 | 78 |
| E3 | 90 | 68 | 68 | 85 | 65 | 50 | 33 | 66 |
| E4 | 70 | 68 | 82 | 71 | 69 | 67 | 33 | 66 |
| E5 | 90 | 84 | 82 | 85 | 69 | 67 | 56 | 76 |
| Nilai rata-rata per heuristik | 86 | 76.4 | 77.4 | 82.8 | 69.6 | 61.4 | 44.4 | 71 |

## 2. CONTENTS OF RESEARCH

### 2.1 Results Analysis Valuation Method Interface

After conducting an initial evaluation of the research conducted, then the analysis will be split in several groups of scope. The groups consisted of analysis steps heuristic evaluation method, and standard analysis of programming code.

In Table 4 show the results of the assessment data is a heuristic principle, the result is a percentage value that has been accumulated.

### 2.2 Standard Code Programming Improvement Method

At this stage will be conducted observations on HTML (Hypertext Markup Language) and CSS (Cascading Style Sheets) using online tools http://validator.w3.org/ and http://jigsaw.w3.org/css-validator/, and for the programming language PHP and JavaScript will be checked manually by comparing the source code of existing programming with programming code standards.

### 2.3 Results and Testing System

In the system testing stage, will be tested to determine errors or omissions on the website. Testing the system is also intended to determine whether the system meets the criteria in accordance with the purpose or not.

Tests conducted beta testing. Beta testing will be conducted by questionnaire method utilizing a questionnaire package PSSUQ (Post-Study System Usability Questionnaire) [14], The questionnaire used to measure visitor satisfaction of the system is implemented [15]. For testing against the standard programming code which is applied would using interviews, and validation of source code programming through the test equipment described in Table 3.

#### 2.3.1 Code Standard Programming Validation

At this stage will be conducted observations on HTML (Hypertext Markup Language) and CSS (Cascading Style Sheets) using online tools http://validator.w3.org/ and http://jigsaw.w3.org/css-validator/. For the PHP programming language PHP will use the tool linter called CodeSniffer [16] [17], and the JavaScript language would be done by using a JavaScript linter called JSCS [18].

1) HTML (Hypertext Markup Language)

Validation is done by checking the online tool validator.w3.org. Below is a table 5 containing the number errors and warnings programming code markup on every page of the website of Sri Baduga.

Gambar 1 CSS Validation Of New Website Sri Baduga



| No. | Website Page | Number of Errors | Numbers of Errors |
|---|---|---|---|
| 1 | http://dian-gunawan.work/baru | 0 | 2 |
| 2 | http://dian-gunawan.work/visit | 0 | 2 |
| 3 | http://dian-gunawan.work/baru/tur_grup | 0 | 2 |
| 4 | http://dian-gunawan.work/baru/agenda | 0 | 2 |
| 5 | http://dian-gunawan.work/baru/agenda/read/ | 0 | 2 |
| 6 | http://dian-gunawan.work/baru/koleksi | 0 | 2 |
| 7 | http://dian-gunawan.work/baru/koleksi/fetch/1 | 0 | 2 |
| 8 | http://dian-gunawan.work/baru/berita | 0 | 2 |
| 9 | http://dian-gunawan.work/baru/berita/read/1 | 0 | 2 |
| 10 | http://dian-gunawan.work/baru/sambutan | 0 | 2 |
| 11 | http://dian-gunawan.work/baru/sejarah | 0 | 2 |
| 12 | http://dian-gunawan.work/baru/struktur | 0 | 2 |
| 13 | http://dian-gunawan.work/baru/pameran | 0 | 2 |
| 14 | http://dian-gunawan.work/baru/fasilitas | 0 | 2 |
| 15 | http://dian-gunawan.work/baru/kontak_kami | 0 | 2 |

2) CSS (Cascading Style Sheets)

On the CSS programming code which is tested, there are no mistakes and pass the validation test programming code. In Figure 1 is presented in the form of a screenshot of the results of the validation performed on one page website Sribaduga museum.

3) PHP (Hypertext Preprocessor)

On the programming code CSS web site museum Sri Baduga which is tested, validation is only performed on self-written CSS. CSS programming code such as CSS Bootstrap or Slick Slider will not be validated, the reason the code is applied not made by the researcher. Below is a table 6 which is contains the number of errors and warnings programming code markup on every page of the website of Sri Baduga.

Tabel 4 Number of Errors on PHP Language of New Website of Sri Baduga

| No. | Modul Name | Number of Errors |
|---|---|---|
| 1 | Application/Agenda.php | 2 |
| 2 | Application/Berita.php | 0 |
| 3 | Application/Error_404.php | 0 |
| 4 | Application/Fasilitas.php | 0 |
| 5 | Application/Koleksi.php | 1 |
| 6 | Application/Kontak_kami.php | 0 |
| 7 | Application/Mainpage.php | 0 |
| 8 | Application/Pameran.php | 2 |
| 9 | Application/Sambutan.php | 0 |
| 10 | Application/Search.php | 0 |
| 11 | Application/Sejarah.php | 0 |
| 12 | Application/Struktur.php | 0 |
| 13 | Application/Tur_grup.php | 0 |
| 14 | Model/Mod_agenda.php | 0 |
| 15 | Model/Mod_blog.php | 0 |
| 16 | Model/Mod_visit.php | 0 |
| 17 | Model/Mod_fasilitas.php | 0 |
| 18 | Model/Mod_koleksi.php | 0 |
| 19 | Model/Mod_kontak.php | 0 |
| 20 | Model/Mod_homepage.php | 0 |
| 21 | Model/Mod_ruang.php | 0 |
| 22 | Model/Mod_struktur.php | 0 |
| 23 | Model/Mod_search.php | 0 |
| 24 | Model/Mod_sejarah.php | 0 |

4) JavaScript

On the JavaScript programming code web site museum Sri Baduga which is tested, validation is only performed on self-written JavaScript. JavaScript programming code such as JavaScript Bootstrap or Slick Slider will not be validated, the reason the code is applied not made by the researcher. Below is a table 7 which is contains the number of errors and warnings programming code markup on every page of the website of Sri Baduga.

Tabel 5 Jumlah Error Pada JavaScript Situs Web Sri Baduga Baru

| No. | Modul Name | Number of Errors |
|---|---|---|
| 1 | View/footer_kontak.php | 0 |
| 2 | View/footer_slider.php | 0 |
| 3 | View/footer_tur.php | 0 |
| 4 | View/footer_visit.php | 0 |

**2.3.2 Method of Assessment Interface**

At this stage will be carried out questionnaire [14] which is asked directly to the 40 public respondents. Respondents will test the old website of Sri Baduga museum and the new web site of Sri Baduga museum. It is intended to test the level of satisfaction of visitors to the websites of Sri Baduga the old museum to the website of Sri Baduga new museum.

**2.3.3 Scope of Research Scope of Research**

The scope of the research activities of this research include testing the interface on the desktop and mobile display. Mobile display used in this test is limited on the width of the screen. Here is presented a table of 8 which is a mobile display that can be used as the test material interface.

Tabel 6 Ukuran Layar Mobile

| Screen Type | Height and Width |
|---|---|
| QVGA | 320 x 480 piksel |
| HVGA | 480 x 720 piksel |
| WVGA | 480 x 800 piksel |
| qHD | 640 x 960 piksel |

**2.3.4 PSSUQ Results**

Questionnaires which is conducted to responder is based on packet questions PSSUQ (post-study questionnaire system usability). Here are the results of questionnaires calculation of old website Sri Baduga museum that has been grouped into four groups of sub-scale.

Tabel 9 Ukuran Layar Mobile

| No. Responden | Jenis Sub Skala PSSUQ | | | |
|---|---|---|---|---|
| | Overall | System Quality | Information Quality | Interface Quality |
| 1 | 5.73 | 5.60 | 5.50 | 6.25 |
| 2 | 5.31 | 4.83 | 5.67 | 5.50 |
| 3 | 5.19 | 4.83 | 5.33 | 5.50 |
| 4 | 4.56 | 4.83 | 4.50 | 4.25 |
| 5 | 6.00 | 6.17 | 5.83 | 6.00 |
| 6 | 6.06 | 6.00 | 5.83 | 6.50 |
| 7 | 3.88 | 3.83 | 3.83 | 4.00 |
| 8 | 5.06 | 4.83 | 5.33 | 5.00 |
| 9 | 4.00 | 4.00 | 4.00 | 4.00 |
| 10 | 5.63 | 5.50 | 5.67 | 5.75 |
| 11 | 5.56 | 5.67 | 5.67 | 5.25 |
| 12 | 5.25 | 5.33 | 5.17 | 5.25 |
| 13 | 4.50 | 4.33 | 4.50 | 4.75 |
| 14 | 4.00 | 4.00 | 4.00 | 4.00 |
| 15 | 4.38 | 4.67 | 4.17 | 4.25 |
| 16 | 5.19 | 5.67 | 4.83 | 5.00 |
| 17 | 5.63 | 5.67 | 5.83 | 5.25 |
| 18 | 6.25 | 6.33 | 6.17 | 6.25 |
| 19 | 6.13 | 6.67 | 6.33 | 5.00 |
| 20 | 5.81 | 5.67 | 6.17 | 5.50 |
| 21 | 6.19 | 6.17 | 6.17 | 6.25 |
| 22 | 5.69 | 5.50 | 5.67 | 6.00 |
| 23 | 4.00 | 4.50 | 3.50 | 4.00 |
| 24 | 4.56 | 4.83 | 3.83 | 5.25 |
| 25 | 5.13 | 5.17 | 5.00 | 5.25 |
| 26 | 4.56 | 4.67 | 4.50 | 4.50 |
| 27 | 4.75 | 4.67 | 4.83 | 4.75 |
| 28 | 6.81 | 6.67 | 7.00 | 6.75 |
| 29 | 5.00 | 5.00 | 5.00 | 5.00 |
| 30 | 6.00 | 6.00 | 6.00 | 6.00 |
| 31 | 5.31 | 4.17 | 6.00 | 6.00 |
| 32 | 5.06 | 5.50 | 4.50 | 5.25 |
| 33 | 6.56 | 6.33 | 6.83 | 6.50 |
| 34 | 6.38 | 6.33 | 6.33 | 6.50 |
| 35 | 6.81 | 6.67 | 7.00 | 6.75 |
| 36 | 6.00 | 6.00 | 6.00 | 6.00 |
| 37 | 6.56 | 6.67 | 6.50 | 6.50 |
| 38 | 6.00 | 6.33 | 5.83 | 5.75 |
| 39 | 5.88 | 5.83 | 6.00 | 5.75 |
| 40 | 5.75 | 6.00 | 5.50 | 5.75 |
| Rata-rata | 5.43 | 5.44 | 5.41 | 5.44 |

Based on the above beta testing, that it can be concluded that:

1. Based on the conclusions derived from the results of the average sub-scale overalls, Sri museum website Baduga long to get approval from an average of as much as 97.5% of respondents from 40 respondents and the average sub-value scale 5:43. this shows that the site performance is quite good, because all respondents expressed approval that the web site is quite good overall.
2. Based on the conclusions derived from the results of the average sub-scale overalls, Sri museum website Baduga long to get approval from an average of as much as 97.5% of respondents from 40 respondents and the average sub-value scale 5:44. It is claimed that the new website is easy to use, comfortable to use, and users are likely to believe it will be a productive when using the web site of Sri Baduga new museum.
3. Based on the conclusions derived from the results of the average sub-scale information quality, website Sri Baduga old museum earn on average as much as 92.5% of respondents from 40 respondents and the average sub-value scale 5:41. This shows the quality of a good system, but as much as 7.5% of the 40 respondents are not or less agree with the quality of the systems offered. This is due to the lack of effectiveness of the information presented, because the information presented is not renewed.

Based on the conclusions derived from the results of the average sub-scale interface quality, the website

of Sri Baduga old museum earn on average as much as 97.5% of respondents from 40 respondents and the average sub-value scale 5:44. This shows that respondents liked the new interface than the old interface, the new look of the website has also been optimized to be opened on the mobile display.

## 3 CONLUSIONS

At this stage, will be explained about the conclusions of the research that has been done. Based on the number of activities that have been carried out from start to measure the interface on the web site of Sri Baduga old museum, up to conduct an assessment of the new interface. It can be concluded through a couple of points the conclusions below.

a. From the results interface improvements that have been made, it can help visitors to the website of Sri Baduga museum to present the appearance of the site more attractive and interactive.
b. From the results interface improvements that have been made, it can help visitors to the website of Sri Baduga museum more convenient to access the site on mobile display.
c. From the results of which is the improvement the standard programming code that has been done, it can help a team of website developers museum Sri Baduga in setting proper standards of programming code and valid for website development.

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