Black Box Testing on ukmbantul.com Page with Boundary Value Analysis and Equivalence Partitioning Methods

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Abstract. One of the most important aspects in information system development is system testing. System testing aims to evaluate the capabilities of the application and determine whether the program developed is in accordance with the expected results. It also aims to ensure that the application is of the best quality and is maintained. In this study, system testing was conducted on ukmbantul.com application. ukmbantul.com is a website that is used to promote the potential of craftsmen/home-based businesses in Bantul. The testing is done by black box testing and all data input is tested with various data that are not in accordance with the rules. Black Box Testing is done by testing the application without seeing/knowing the internal structure of the code or program. The research was carried out using boundary value analysis and equivalence partitioning methods. The results show that the development of ukmbantul.com has considered the limitations in data entry. The form used for the data entry process has been validated in accordance with the applicable limitations. Keywords: Testing, ukmbantul.com, black box, boundaries

1. Introduction

The most widely used media for promotion is social media and internet media. In advertising nowadays, social media or websites are used more commonly than billboards or banners. The advantages of using internet media include the unrestricted coverage of the promotional area. It can also be accessed at any time. One of the efforts to optimize the promotion of small business actors is to use the ukmbantul.com page. Ukmbantul.com is a website that provides a place for SMEs (Small and Medium Enterprises) in Bantul area to promote businesses located in Bantul and its surroundings.

Along with the increase of internet users, the opportunity to use internet media as a promotional medium is also getting better. With the increasing number of internet users, it also changes people's habits in viewing advertisements. Bolos [1] in his writings argues that effective marketing has always been an important factor in business success. Recent advances in technology have created new opportunities to engage customers through the use of electronic marketing (e-marketing). In the promotion process, it is necessary to innovate and expand networks and strategies for promotion using websites and social media, and online marketing. Isoraite Research [2], explore the importance of promotion in internet media. Promotion on the internet media is almost the same as the promotion that has been done so far. Online marketing still requires marketing planning, strategy, cost evaluation, and social media options. Promotion on the internet is a very important part of the overall promotion process of a company because the Internet has become the main means of communication with the customers.
Another research conducted by Hardiyanto [3], explores the use of a website that can be a promotional media for micro, small, and medium enterprises, especially those in Bantul regency. The website is developed based on google map, so that users can find out the position of the area of the micro, small, and medium enterprises and can see the potential that exists in the micro, small, and medium enterprises. In this paper, testing has not been discussed and the paper focuses on the implementation of micro, small, and medium enterprises' applications based on google map.

The use of the internet, especially the website, does not require only the development of applications or the display of data used as promotion, but also a system testing process. The system testing that is carried out will later aim to see and test the extent to which the application being developed has avoided possible errors. These errors can be caused by program flows that contain errors, run time errors or user errors in inputting data. User errors in inputting data can occur because the system being built does not check every data that the user has input. A good system must check the data input by the user. Every input data must be checked and in accordance with the existing limitations or criteria. Therefore, the system does not experience problems in implementation. It is necessary to test the system. System testing is an investigation carried out in order to obtain information about the quality of the application. Through testing, a software can be viewed objectively and independently and the risks at the implementation stage can be understood. Software testing methods are not only limited to the process of executing a part or the whole program that aims to find bugs, but also as a validation and verification process. [4].

According to Irwan [5], one of the stages in system development is to test the system. System testing is carried out to ensure that users will not find errors while using the system. Black Box Testing is a testing method that focuses on the functional requirements of the software. System testing with the Black Box method is carried out on the Karya Sentosa Waste Bank Management Information System and uses the Equivalence Partitioning testing technique. The results of the research conducted indicate that there are several system validations that have not been fulfilled, even though they have been tested from structural testing.

Jamil [6] in his writing, he explained that the more complex the software being developed will increase the testing process carried out on the software. This test is an effort to ensure the quality of the software being developed. Software testing is an inevitable part of a system development process. Sawant [7] explained that software testing is a technique aimed at evaluating program capabilities and determining that the application built meets quality elements. Software testing is also used to test reliability, usability, integrity, security, capability, efficiency, portability, maintainability and compatibility.

Other research related to system testing is a journal of relevant research, including the testing conducted by Jaya [8], which found out how many errors there are in the software. The test was conducted using black box testing with boundary value analysis. The testing includes design, specifications, and coding. Software testing is a critical element in determining the quality of a software. This study aims to test the existing software in the digital office at Lampung State Polytechnic. Boundary Value Analysis testing is a type of test case that can determine the minimum value, maximum value, and normal value of the data to be tested. The application being tested is able to handle data, both normal data and abnormal data with a success percentage of 91.67%.

Testing conducted by Hidyat [9] regarding online payment for graduation at Syekh-Yusuf Islamic University held once a year in November. Syekh-Yusuf Islamic University uses an online application that is integrated with Siakan (SINA) for the graduation. Black box testing is a test that is carried out by an application to explore the outer side of a software application, starting from the initial appearance to the input. Later, the students who can input graduation data are only students who have completed the requirements. The black box testing strategy has several methods, including Boundary Value Analysis and Equivalence Partitioning. Testing by Nurudin [10] in web-based sales applications the validation process is very important. Validation is a process of checking whether the software meets the specifications and objectives or not. Processes that are not optimal can cause inappropriate data to be stored in the database. Applications designed in such a way must go through a testing phase to ensure the quality of the software itself. Testing can be said to be good if it can find errors that cannot be
revealed. There are several ways of testing that can be done including using Boundary Value Analysis and defining the functionality to be tested.

Other studies that tested website-based information systems included Ahrizal [11], Larrea [12], Xu [13], Ikhlaashi [14] and Jampani [15].

The research carried out were to test the system using the black box method and the objectives of the study were to evaluate and minimize deviations or errors from both the user side and the application results on UKM BANTUL website. The limitation of the research was carried out by testing with 2 methods of black box testing techniques, namely boundary value analysis and partitioning equivalence.

2. Research Method

The object for which the system testing is carried out is the website of https://ukmbantul.com. ukmbantul.com website aims to promote small businesses (SMes) in Bantul and its surrounding areas.

The research was carried out using the black box system testing technique. Black box testing is a test that is carried out by simply observing the results of execution through test data and checking the functionality of the software. Testing is done without looking at the coding and only looking at the input and output of the application. In this test, the research method is carried out using the following techniques [16]:

- **Equivalence Partitioning**
  This technique is a software testing technique that involves dividing the input value into valid and invalid values and selecting representatives from each test data.

- **Boundary Values Analysis**
  This technique is a software testing technique that involves determining the input value and selecting several values from these limits both outside and within these limits as the test data.

3. Discussion and Results

3.1. Testing with Boundary Value Analysis Techniques

3.1.1. Testing on password data entry

Testing is carried out by examining the member registration form, especially on entering the password data. In this form, there are some personal data, including the email and password that will be used to log into the UKM dashboard. ID card number, name, telephone number, hobbies, and addresses are used as personal data. In testing the boundary value analysis, testing will be carried out on a more specific list page in the password section. Table 1 is the test result of password input.

| Testing | Result | Recommendation |
|---------|--------|----------------|
| Testing 1: Password field was inputted with 10 letters containing the word "istakprind". | ![Note](https://example.com) "Remark menti onpoint data." | The validation process was carried out properly and a password containing 10 letters was stored in the database along with other personal data. |
| Testing 2: Password field was inputted with 10 combination characters containing “1999 %% 1999”. | ![Note](https://example.com) "Remark menti onpoint data." | The validation process was carried out properly and a password containing 10 combination characters was stored in the database along with other personal data. |
| Testing 3: Password field was inputted with 15 letters and characters containing the word “istakprind12345". | ![Note](https://example.com) "Remark menti onpoint data." | The validation process was carried out properly and a password containing 10 letters and 5 characters was stored in the database along with other personal data. |
Testing 4: Password field was inputted with 20 letters and characters containing the word "Istakprind! @ $#%^ & * ()".
The validation process was carried out properly and a password containing 10 letters and 10 characters was stored in the database along with other personal data.

Testing 5: Password field was inputted with 3 digits containing the number “123”.
The validation process was carried out properly and a password containing 3 digits of numbers was stored in the database along with other personal data.

Testing 6: Password field was inputted with more than 3 digits containing the number “1234”.
The validation process was carried out properly and a password containing 4 digits of numbers was stored in the database along with other personal data.

From the results of these tests, recommendations that need to be improved include the use of a good password on a website that should consist of a combination of characters containing uppercase, lowercase, numbers and symbols. Passwords should not use common slang words or words contained in the dictionary.

3.1.1.1. Testing on data entry of Identity Card Number
Identification Card Number or what can be referred to as the Identification Number is the identity of every Indonesian citizen. Each person's Identification Number is different. Table 2 is the test result of Identification Card Number data.

| Testing | Result | Recommendation |
|---------|--------|----------------|
| Testing 1: The Identification Card Number field was inputted with 8 digits, which contains the numbers of “84937293”. | The validation process was carried out properly and the new data was stored in the database. |
| Testing 2: The Identification Card Number field was inputted with 16 digits, which contains the numbers of “8493729398374927”. | The validation process was carried out properly and the new data was stored in the database. |

From the test results, recommendation that need to be done was the improvement related to the Identification Card number. The Identification Card number must be in accordance with Government Regulation Number 40 of 2019 concerning Implementation of Law 23/2006 concerning Population Administration. In CHAPTER III concerning Population Identification Number and other Identity Documents, Part One Identification Number, Article 31 Paragraph 1. That the Identification Number consists of 16 (sixteen) digits.

3.1.2. Testing on telephone number data entry
A telephone number is an important communication tool and is needed by every person and company as a medium for personal use and for other needs. Telephone numbers are also important in a large industry where direct sales division can connect with buyers. Table 3 is the test results of telephone number data entry.
### Table 3. The test results of telephone number data entry

| Testing 1: | Result | Recommendation |
|------------|--------|----------------|
| Telephone Number field was inputted with 8 digits containing the numbers “08192778”. | The validation process was carried out properly and new data was stored in the database. |

| Testing 2: | Result | Recommendation |
|------------|--------|----------------|
| Telephone Number field was inputted with 9 digits containing the numbers “081927785”. | The validation process was carried out properly and new data was stored in the database. |

| Testing 3: | Result | Recommendation |
|------------|--------|----------------|
| Telephone Number field was inputted with 10 digits containing the numbers “0815478392”. | The validation process was carried out properly and new data was stored in the database. |

| Testing 4: | Result | Recommendation |
|------------|--------|----------------|
| Telephone Number field was inputted with 11 digits containing the numbers “08154783922”. | The validation process was carried out properly and new data was stored in the database. |

| Testing 5: | Result | Recommendation |
|------------|--------|----------------|
| Telephone Number field was inputted with 12 digits containing the numbers “081547839224”. | The validation process was carried out properly and new data was stored in the database. |

| Testing 6: | Result | Recommendation |
|------------|--------|----------------|
| Telephone Number field was inputted with 13 digits containing the numbers “0815478392226”. | The validation process was carried out properly and new data was stored in the database. |

From the results of the tests, recommendations that need to be improved regarding telephone numbers are that telephone numbers should consist of at least 10 digits of numbers, generally consisting of 12-13 digits of numbers. There is still no standard for how many digits a telephone number is, because telephone users are increasing every year, so the digits of number of a telephone number will automatically increase. However, the minimum number of digits for the telephone number is still at 10 digits. If it is less than 10 digits, it should not be able to be stored in the database or there is a notification “Enter the correct telephone number”.

### 3.2. The result of Equivalence Partitioning

#### 3.2.1. Testing on changing password data

This form is personal data that has been entered at the time of registration. E-mail that is created on the list page will become a permanent username and cannot be edited. In this form, there is also an option to change the password and enter a photo of the product to be promoted. Table 4 is the results of the password data editing test.
Table 4. the results of testing data entry on the password data edit menu

| Testing                                      | Result                                      | Recommendation                                                                 |
|----------------------------------------------|---------------------------------------------|--------------------------------------------------------------------------------|
| Testing 1: All fields are edited according to the requirement | ![Note](Note.png)                          | The validation process was carried out properly and the updated data was stored in the database. |
| Testing 2: All fields are edited using blank data | ![Note](Note.png)                          | The validation process was carried out properly and blank data was stored in the database. |
| Testing 3: All fields are edited using junk data | ![Note](Note.png)                          | On a good website, some fields such as name and hobby should only be entered with letters. Meanwhile, other fields can be mixed between letters and numbers, such as addresses. |

3.2.2. Testing on photo file data entry

In the UKM data display, users can add data on SMEs or goods to be sold. In this display, there is also some sales data, such as business name, type of commodity, Indonesian Standard Industrial Classification, classification, description, and photos. In the Equivalence Partitioning test, testing was carried out on the SMEs data page, specifically in the photo section. Photos are displays that will attract buyers to buy. There are also many photo formats, such as JPG or JPEG, PNG, and GIF. Various photo formats will also affect the appearance of the photos. Table 5 shows the results of testing on data entry on the login menu.

Table 5, the results of testing on data entry on the SMEs data menu

| Testing                                           | Result                                      | Recommendation                                                                 |
|---------------------------------------------------|---------------------------------------------|--------------------------------------------------------------------------------|
| Testing 1: JPG or JPEG Photo Format.               | ![Note](Note.png)                          | The validation process was carried out properly and new data was stored in the database. |
| Testing 2: PNG Photo Format.                       | ![Note](Note.png)                          | The validation process was carried out properly and new data was stored in the database. |
| Testing 3: GIF Photo Format.                       | ![Note](Note.png)                          | The validation process was carried out properly and new data was stored in the database. |

From the results of the tests, recommendation that need to be improved is that on a good buying and selling website, the image formats that can be inserted are JPG or JPEG and PNG. As for GIF, not all websites can use the GIF format. However, if GIF is used, it should appear on the SMEs Data display because photo files are stored in the database but cannot be displayed on the SMEs Data.

3.2.3. Testing of all registration data

In this form, there are some personal data, including e-mail and password, that will be used to log into the SMEs dashboard. Identification Card number, name, telephone number, hobbies, and users'
addresses are used as personal data. Figure 6 shows the forms entering all registration data and Table 6 is the results of testing on data filling in the registration menu.

| Testing | Result | Recommendation |
|---------|--------|----------------|
| Testing 1: All fields in the form are filled with data according to the requirements. | ![Note](image1) | The validation process was carried out properly and the correct data was stored in the database. |
| Testing 2: All fields in the form are filled with blank data. | ![Note](image2) | On a good website, when blank data is entered, the system should respond back by giving a notification "data cannot be empty". |
| Testing 3: All fields are filled with junk data. | ![Note](image3) | The validation process was carried out properly and data that does not comply with the requirements was stored in the database. |

3.2.4. Testing on the username and password at login

This display is the login page used by the user or admin to enter the SMEs dashboard. On the login page, there is a username (e-mail) and password that has been created on the list page. They are used to log in on the login page. Table 7 shows the testing results for filling in the username and password fields on the login page.

| Testing results of testing on filling in the username and password fields on the login page | Testing | Result | Recommendation |
|----------------------------------------------------------------------------------|--------|--------|----------------|
| Testing 1: All fields in the form are filled with data according to the requirements. | ![Image](image4) | The login process was done well and went directly to the user dashboard. |
| Testing 2: All fields in the form are filled with blank data. | ![Image](image5) | On a good website, when logging in and not entering anything, there should be a notification "username and password must not be empty" or "username and password must be filled in". |

4. Conclusion

With the black box testing using the boundary value analysis and equivalent partitioning methods, the proper and correct functionality of the website can be found out. The start of registration, logging in, and entering the user dashboard have good and correct validation. Testing using the equivalence partitioning method is more about the technique of entering data and checking it functionally and knowing whether validations or notifications will appear or not. Whereas testing using the boundary value analysis method refers to the technique of entering data based on the boundaries according to the requirements, such as ID Card numbers and telephone numbers.
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