Boundary Value Analysis Testing Techniques on Learning Management System Applications

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Abstract - Application of Learning Management System of Lampung State Polytechnic (LMS Polinela) is an elearning application developed as an alternative teaching media that aims to complement existing teaching media to help students learn independently so that learning outcomes are more optimal and efficient. This study uses a black box testing boundary value analysis technique in testing the Polinela LMS application. This boundary value analysis technique works by determining the upper and lower limits of the data to be tested, after which the data is inputted to the Polinela LMS application. The results of the review of the journal from Zuriati et al with the title "Testing Technique of Boundary Value Analysis in the Polinela Learning Management System Application" is to provide a clear understanding of the theory of Boundary Value Analysis. The Boundary Value Analysis technique described has been able to provide a description of the stages and processes in testing each functionality. The process functionality is explained thoroughly so that the reader can better understand and know the entire process that is in the application.
Index Terms— Learning management system, black box, boundary value analysis

I. INTRODUCTION

Information system testing functions to find errors that exist in the information system so that the error can be corrected[1]. Making an information system refers to several needs that have been defined and agreed upon in advance. Information system testing is needed to verify and test the validation that the information system being built is in accordance with the needs, if the information system that is built is not in accordance with the plans and requirements that have been previously defined then the user will be disappointed and the company making the information system will lose the potential of its users .Then testing the information system becomes very important so that the system is made in accordance with the functions and needs at the previous planning stage[2]. Polinela Learning Management System Application is an elearning application developed as an alternative teaching medium that aims to complement existing teaching media to help students learn independently so that learning outcomes are more optimal and efficient. This study uses a black box testing boundary value analysis technique in testing the Polinela LMS application. This boundary value analysis technique works by determining the upper and lower limits of the data to be tested, after which the data is inputted to the

Polinela LMS application. The application output will later be observed and recorded if it is in accordance with what is desired. The final test results on Polinela LMS showed that there were no errors when validating data, so the data stored in the database was in accordance with the expected data[3].

II. LITERATURE REVIEW

There are several theoretical foundations that must be understood before conducting research on testing Boundary Value Analysis.

2.1 Information system

Information systems are a combination of hardware, software, communication, networking, and data resources where you can collect, change and store information in an organization[4]. There are two types of information systems based on their functions and uses, namely operational support systems and management support systems[5].

2.2 Black Box Testing

Black box testing is a system or application testing that focuses on the functional specifications of the system or application. System testers can define a set of input conditions and test the functional specifications of the system. Black Box Testing tends

to be used to find incorrect or non-existent functions, data structure and database access errors, initialization and termination errors, system interface errors, performance errors. There are several techniques to carry out Black Box Testing including Boundary Value Analysis / Limit Testing, Comparison Testing, Robustness Testing, Equivalence Partitioning, Behavior Testing, Requirement Testing, Performance Testing, Endurance Testing, Sample Testing, Cause and Effect Test Cause-Effect Relationship Testing)[6].

2.2 Boundary Value Analysis

Boundary Value Analysis (BVA) is a black-box testing technique that tests the upper and lower limits of a value inputted into the system. Some things that underlie Boundary Value Analysis are as follows:
   a) Boundary Value Analysis focuses on a value boundary where the possibility of hidden defects.
   b) Boundary Value Analysis leads to the selection of test cases by carrying out boundary values. Boundary Value Analysis is also a test case design by completing the Equality class test. Not only focusing on input conditions, Boundary Value Analysis also emphasizes the output domain.
   c) Boundary Value Analysis tests input around the upper and lower limits with a valid scope of values.
   d) Boundary Value Analysis tests the maximum and minimum values.
   e) Boundary Value Analysis tests the limits of the data structure used, for example, such as array size[7].

2.3 Literature review

The discussion on the use of system testing techniques using Boundary Value Analysis has been carried out by several previous researchers among the following. Doni Andriansyah uses Boundary Value Analysis techniques to test the final project counseling management information system where this method has been effective for finding errors in system functionality[7]. Rosma also applies the Boundary Value Analysis technique in testing inventory information systems in a company where the results of this method are inventory information systems software companies pharmaceutical midwives companies can test all the features or menus contained in the system and software developers can easily make improvements to points that must be fixed[8]. Rochmad Fauzi made the design and implementation

of the Internet Of Things monitoring the temperature and humidity of laboratory rooms where the Boundary Value Analysis method was used to test and analyze the process of the system created[9]. Okta et al made a data mining application design to predict the learning outcomes of high school-based high school students with the KNN algorithm where for testing the data input using boundary value analysis[10].

III. RESEARCH METHODOLOGY

The research method used in collecting data and information is by using descriptive methods which solve and answer problems by describing systematically, actually and accurately based on the facts studied. Historical method of analysis is a method by collecting data and information in the past as a guide for measuring current values.

IV. RESULTS AND DISCUSSION

The application of the Boundary Value Analysis testing technique discussed is the Polinela Learning Management System Application. Boundary Value Analysis is used to test the system's functionality whether it meets the expected needs or not. System testing is carried out on added course functionality, added functionality material, added assignment functionality, and functionality of UTS and UAS questions. Following is the testing process for each functionality that is tested.

4.1 Testing Functions Add Course Form

The following are the results of tests on Form Add Course Functionality.

Table 1. Testing Form Add Course Functionality

No	Function	That result is expected	Experimental results	Conclusions
1.	Add course button	Can add courses	True	Success
2.	Enter the school year	Can fill in the school year	True	Success
3.	Enter the course title	Can fill in the course title	True	Success

No.		Results		Conclusion
4.	Enter the course description	Can fill in the course descript ion	True	Success

Test results for Add Course functionality, Enter School Year, Enter Course Title, and Enter Course Description are successful.

4.2 Testing Form Add Functionality Material
The following are the results of tests on the Form Add Material Functionality

Table 2. Form Functionality Add Material

No.	Test Process	Results	Conclusion
1.	Click the Add Material button	Can add material	Success
2.	Click the Add Material button	Can add the title of the material	Success
3.	Enter contents	Can add content to the material	Success
4.	Click the Submit Material button	Can save material	Success

Test results for the Add Material functionality, Enter Material Title, Enter Material Content, and Submit Material Button have been successful.

4.3 Testing Functionality Add Tasks
The following are the results of the tests on Add Task Functionality.

Table 3. Testing Functionality Form Add Task

No.	Test Process	Results	Conclusion
1.	Click the Add Task button	Can add Tasks	Success

The results for testing the added functionality of the task have been successful.

4.4 Testing the Functionality of the Mid-Term Exam and Final Exam

Table 4. Testing the Functionality of Mid-Term Exam and Final Exam

No.	Test Process	Results	Conclusion
1.	Click the UTS button	Can add UTS	Success
2.	Click the UAS button	Can add UAS	Success

The test results for added functionality about UTS and UAS questions were successful.

V. CONCLUSION
The results of a review of the journal from Zuriati et al with the title "Testing Technique Boundary Value Analysis on Polinela Learning Management System Applications" are:
1. The contents of the journal provide a clear understanding of the theory of Boundary Value Analysis.
2. The Boundary Value Analysis technique described has been able to provide an overview of the stages and processes in testing each functionality in the application.
3. Process functionality that is explained thoroughly so that the reader can better understand and know the entire process that is in the application.
4. Number of references regarding Boundary Value Analysis explained in the journal.
5. The contents explained are easy to understand.
6. The contents of the journal can provide references for other writers as a reference for making journals that discuss about Boundary Value Analysis.

REFERENCES
[1] P. B. Nirpal, "A Brief Overview Of Software Testing Metrics," *Int. J. Adv. Res. Comput. Commun. Eng.*, vol. 3, no. 12, pp. 4655–4659, 2013.
[2] I. M. S. Ardana, "Pengujian Software Menggunakan Metode Boundary Value Analysis Dan Decision Table Testing," vol. XIV, no. 11, pp. 40–47, 2019.
[3] Zuriati, D. K. Widyawati, I. S. Sitanggang, and A. Buowo, "Teknik Pengujian Boundary Value Analysis Pada Aplikasi Learning Management System Polinela," *TAM (Technology Accept. Model.*, vol. 9, no. 2, pp. 86–92, 2018.
[4] S. I. Murpratiwi, A. W. Gustina, and I. C.

Dewi, "Design of Enterprise Information System with TOGAF Framework (Case Study : STD Bali)," *Int. J. Eng. Emerg. Technol.*, vol. 1, no. 1, pp. 20–25, 2016.

[5]   I. M. G. Yudiyana, A. Sumichan, and N. W. S. Ariyani, "Management Information System of Event Organizer," *Int. J. Eng. Emerg. Technol.*, vol. 3, no. 2, pp. 116–122, 2018.

[6]   Y. Sutanto and A. Utomo, "PENGUJIAN Aplikasi Website Menggunakan Black Box Testing Boundary Value Analysis (Studi Kasus : Aplikasi website praktekdokter)," *J. SAINSTECH Politek. Indonusa Surakarta*, vol. 5, no. 2, pp. 52–57, 2018.

[7]   D. Andriansyah, "Pengujian Kotak Hitam Boundary Value Analysis Pada Sistem Informasi Manajemen Konseling Tugas Akhir," vol. 7, no. 1, pp. 20–25, 2018.

[8]   S. Rosma, "Pengujian Sistem Informasi Inventory Pada Perusahaan," vol. 4, no. May, pp. 0–9, 2019.

[9]   M. Temperatur, D. A. N. Kelembaban, and R. Laboratorium, "Sionlap v2: desain dan implementasi internet of things monitoring temperatur dan kelembaban ruang laboratorium," vol. 07, no. 02, pp. 52–61, 2019.

[10] O. Riveranda, M. Ihsan Zul, and M. R. A. Saf, "Rancang Bangun Aplikasi Data Mining untuk Memprediksi Hasil Belajar Siswa Sekolah Menengah Atas Berbasis Web dengan Algoritma K-NN (Studi Kasus: SMKN 2 Pekanbaru)," *J. Komput. Terap.*, vol. 2, no. 2, pp. 69–82, 2016.