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Equivalence partitioning and cognitive walkthrough testing on the training prama website

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ABSTRACT

The Prama Training Website, developed by PT. Triputra Karya Lestari, aims to support employee skill development. However, the platform is underutilized due to usability issues and non-functional features. To address these problems, a two-pronged evaluation approach was conducted: Functional Testing using the Equivalence Partitioning (EP) method, and Non-Functional Testing through Cognitive Walkthrough (CW). Testing was carried out in two iterative stages. In stage one, 127 issues were identified 31 from EP and 96 from CW, while stage two revealed 12 remaining issues. These findings informed the design of a high-fidelity prototype, which incorporated targeted improvements to interface functionality and usability. The development culminated in the implementation of a revised Front-End Final Prototype, providing a more intuitive and accessible user experience for employees.

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1. INTRODUCTION

In the digital era, online training platforms have become a critical component in improving organizational performance. They provide flexible, scalable access to knowledge, allowing employees to enhance their skills and align their competencies with evolving company needs. As a response to these demands, PT. Triputra Karya Lestari developed the Prama Training Website to support employee development across various roles. With improved employee quality, the company aims to achieve higher product and service standards (Bukit Benjamin et al., 2018).

Despite its intended function, the platform is underutilized. Based on internal observations and interviews with Human Resources personnel, the website faces two main issues: (1) several features are non-functional, and (2) the user interface is considered difficult to understand and interact with. These problems hinder user engagement and are suspected to significantly affect both the participation rate and the completion of training modules. A confusing or unintuitive interface may lead users to abandon the training process, thus undermining the company's digital learning investment.

To address these problems, a systematic evaluation is required to identify both technical and usability issues. However, previous internal assessments have not yet

integrated structured testing approaches that consider both functional and non-functional aspects. This study fills that gap by combining Equivalence Partitioning (EP) to evaluate system functionalities and Cognitive Walkthrough (CW) to assess user experience—particularly in aspects of learnability and interface logic flow (Ginting et al., 2021).

The purpose of this research is threefold: (1) To identify and classify functional and usability problems in the Prama Training Website; (2) To apply EP and CW methods in a two-stage iterative testing process to refine the design; and (3) To develop a high-fidelity prototype based on empirical findings to improve user experience and system usability.

The selection of EP as a Functional Testing method is based on the small number of researchers, because it can reduce the number of Tests without reducing the scope of testing. The selection of EP also aims to examine and group data input and output according to their functions. The selection of CW as a Non-Functional Testing method is based on the problems experienced by users. Users said that it was difficult to understand the appearance of the Training Prama website. This problem can be categorized into the Learnability aspect. According to (Ginting et al., 2021), the CW method is very suitable for solving problems in the Learnability aspect. Functional testing is a type of software testing that aims to ensure that each function in the system works according to the requirements that have been set (Singh, 2012) (Uminingsih et al., 2022). This testing does not pay attention to the internal aspects of the software, such as source code or its internal structure, but rather evaluates the system output based on the input provided (Sianturi et al., 2021). Thus, this testing focuses on validating that the developed features run according to specifications and meet user or business needs. Some methods commonly used in functional testing include scenario-based testing, test case testing, and data-based testing (Usman et al., 2024). There are various methods that can be used in Functional testing, one of which is Equivalence Partitioning. Equivalence Partitioning is a Testing method that aims to reduce the number of test cases by grouping input data into several categories or classes that are considered to have similar characteristics. (Singh, 2012), (Siahaan et al., 2022), (Nidhra, 2012). Each of these classes is expected to produce the same response from the system being tested (Nurfathullah, 2024). In this method, only one value from each group is tested, assuming that if one value in the group works properly, then the other values in the same group will also work properly (Simalango, 2023). Equivalence Partitioning helps improve testing efficiency by minimizing duplication of testing on similar input data and ensuring optimal test coverage with fewer test cases.

Non-Functional Testing is a type of software testing that aims to evaluate aspects of system quality that are not directly related to specific functions or features, but rather to how the software works under various conditions (Aebersold, 2019). This testing includes factors such as performance, security, reliability, scalability, and ease of use [8]. Unlike Functional Testing which focuses on what the system does, Non-Functional Testing places more emphasis on how the system operates (Dave et al., 2018). The main purpose of this testing is to ensure that the software is able to handle the expected workload, operate efficiently, and meet the quality standards set for its production environment (Pham, 2024). One example of Non-Functional Testing is Usability Testing. Usability Testing is a testing method that aims to assess the extent to which a product or system, such as a software application or website, is easy and convenient for users to use (Barnum, 2020). This testing aims to identify constraints in the user interface that can affect the user experience (Rahayu & Ernawati, 2024). In the process, users are asked to complete certain tasks using the system being tested, while researchers observe their behavior, record difficulties, errors, and feedback provided. Usability Testing not only ensures that the system functions properly, but also ensures that the system is intuitive and meets user expectations (Kumar et al., 2024; Nielsen, 1994). The results of this test

are often used to refine the design to make it easier to understand and use. In Usability Testing there are also several methods that are often used, one of which is Cognitive Walkthrough (Khadijah, 2022). Cognitive Walkthrough is a Testing method that is carried out with detailed procedures and explicitly describes the user's problem-solving process to evaluate the ease of use of a product (Ginting et al., 2021), (Siahaan et al., 2024). This method focuses on the cognitive activities of users when interacting with features or completing tasks (Yuana Putra & Waspodo, 2024). In addition, Cognitive Walkthrough provides an evaluation based on the suitability of the user's appearance with the established guidelines (Firmansyah et al., 2024; Tauran et al., 2024). This process involves a UI/UX expert (Expert) who has expertise in identifying usability problems and providing recommendations for improvements to the product being tested (Harley, 2018).

2. RESEARCH METHOD

The following describes the research methods used. The research method is explained in Figure 1.

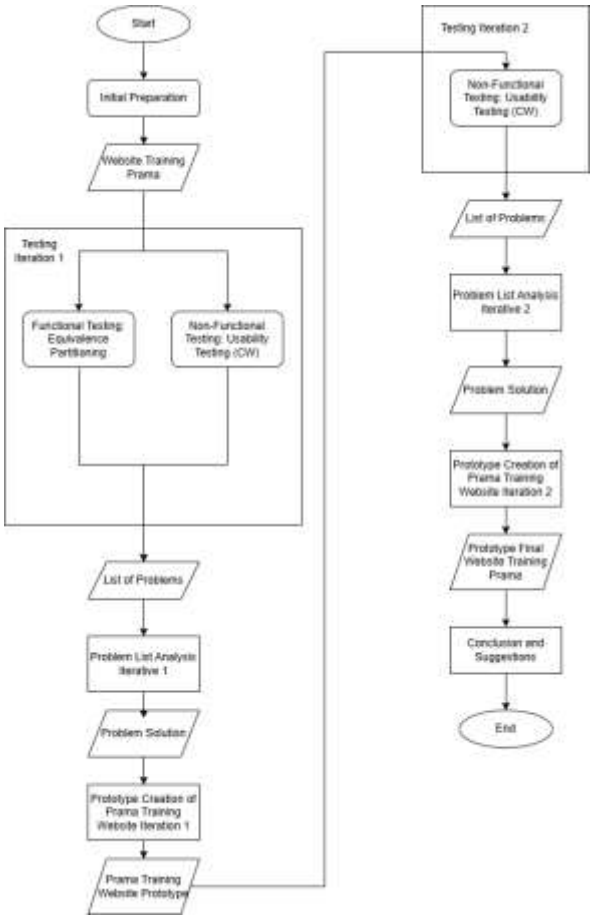

Figure 1 Research Stages Flow

This study applied an evaluative approach through two types of testing: Equivalence Partitioning (EP) for functional aspects and Cognitive Walkthrough (CW) for usability aspects. At the CW stage, testing was conducted by three expert evaluators with backgrounds in system development and usability evaluation experience. Although the evaluation was carried out by experts, their involvement was designed to simulate end-

user perspectives using realistic task scenarios. However, it is acknowledged that actual end-user characteristics, such as age, digital literacy, and department affiliation, may influence how users interact with the system. Therefore, evaluator selection considered diversity in professional experience and familiarity with institutional context, to partially reflect the variation present among actual end-users. In the future, it is recommended to involve user representatives from various user profile groups during subsequent testing stages to obtain a more comprehensive understanding.

2.1 Equivalence Partitioning

The following are the stages carried out in EP Testing (Dwi Yuliansyah Kusnadi & Gingin Sutisna, 2024; Putri et al., 2024):

a. Preperation

The researcher will analyze the features on the Prama Training website by determining the Input Domain, separating valid and invalid partition classes, determining the Test Value, and creating a Test Scenario to be used.

b. Implementation

The researcher will run all the Test Scenarios that have been created. After running, the researcher will record the results obtained after running the Test Scenario.

c. Documentation

After completing all the Test Scenarios with Equivalence Partitioning, the researcher will summarize the results of the tests carried out and will be made in the form of a table. For EP Testing, only 1 Stage is carried out, because in Stage 2, the Prama Training website is still in the form of a High-Fidelity Prototype.

2.2 Cognitive Walkthrough

The following are the stages carried out in CW testing (Firmansyah et al., 2024):

a. Preparation

The researcher will create a Testing Scenario that will be used by the Expert in conducting the test. After the Researcher creates the Testing Scenario, the Researcher will determine the Expert who will assist the Researcher in this test.

b. Implementation

The testing will begin with the Researcher providing a brief explanation of the Prama Training website, Research Objectives, and the Testing Scenario that the Expert will use in conducting the test. Then the Expert will start running the Testing Scenario. The Expert will notify regarding the Problem Findings found. The Expert will also notify regarding the Usability aspects that are violated.

c. Documentation

The Researcher will summarize the test results from the Expert. The test results will be summarized and will be made in the form of a table.

For CW Testing, it is carried out in 2 Stages.

2.3 Problem Finding Analysis

Researchers analyze the Problem Findings found in Functional and Non-Functional Testing in Phase 1 and Phase 2. For Equivalence Partitioning Testing, the Improvement Solutions to be carried out by Researchers are taken from the Expected Results in each Test Scenario. For Cognitive Walkthrough Testing, Researchers will analyze the Problem Findings from each participating Expert. Researchers will analyze the Improvement Suggestions given by each Expert based on the violated aspects and the Severity Rating given.

2.4 Prototype Making

After the Improvement Solution is obtained through the analysis of Problem Findings from the Equivalence Partitioning Test and Cognitive Walkthrough in Phase 1, the research will continue to the stage of creating a prototype of the Prama Training website. At this stage, a prototype will be developed in the form of a High-Fidelity Prototype. The prototype will be designed based on the previously determined Improvement Solution to ensure that the resulting design is more optimal and in accordance with user needs.

3. RESULTS AND DISCUSSIONS

3.1 Equivalence Partitioning

EP testing runs 186 Test Scenarios, consisting of 155 Test Scenarios on the Admin Page and 31 Test Scenarios on the User Page. On the Admin Page, there are 26 failed Test Scenarios. The following shows the features that have failed Test Scenarios.

Table 1 Feature with Failed Test Scenario on Admin Page

Feature	Failed Test Scenario
Adding Material	4
Changing Materials	4
Added Quizzes	2
Changing Quizzes	2
Adding Questions (Multiple Choice)	1
Adding Questions (Fill-in)	1
Added SOPs	1
Changing SOPs	1
Adding Employee Accounts	2
Adding Employee Data	2
Changing Employee Data	2

There are 2 types of failed Test Scenarios that most often occur in several features, namely the Test Scenario when the Admin clears the Text Field and when the Admin inserts a photo. On the User Page, there are 7 failed Test Scenarios. The following shows the features that have failed Test Scenarios.

Table 2 Feature with Failed Test Scenario on User Page

Feature	Failed Test Scenario
Taking the Quiz	6
Changing Profile Photo	1

The most failed Testing Scenarios occur in the Quiz feature. This is because the Quiz feature has not been developed properly, so Users still cannot use it.

3.2 Cognitive Walkthrough

CW Testing runs 23 Test Scenarios, consisting of 14 Test Scenarios on the Admin Page and 9 Test Scenarios on the User Page. On the Admin Page, Expert 1 found 30 Problem Findings, Expert 2 found 19 Problem Findings, and Expert 3 found 20 Problem Findings. The following shows the Problem Findings by Expert 1 on the Admin Page.

Table 3 Problem Findings by Expert 1 on Admin Page

Task	Evaluation Result	Problem Category	Severity Rating	Improvement Suggestions
Login to Account	The message "NIP and Password are incorrect!!!" that appears when the user enters the wrong NIP and	Learnability	1	Maybe with better language, like "Please check your NIP and Password again.".

	password should be changed.

For Admin Page, Problem Findings by Expert 1 mostly violate the Error Prevention aspect. Problem Findings by Expert 2 mostly violate the Memorability aspect. Problem Findings by Expert 3 mostly violate the Error Prevention aspect. On the User Page, Expert 1 found 10 Problem Findings. Expert 1's Problem Findings mostly violated the Error Prevention aspect. Expert 2 found 10 Problem Findings. Expert 2's Problem Findings mostly violated the Error Prevention aspect. Expert 3 found 7 Problem Findings. Expert 3's Problem Findings mostly violated the Efficiency aspect.

CW Testing is also performed in Phase 2 iteration. In Phase 2 CW Testing, Testing still runs the same Test Scenario as Phase 1 CW Testing. On the Admin Page, Expert 1 found 6 Problem Findings. Expert 1's Problem Findings mostly violated the Satisfaction aspect. Expert 2 found 4 Problem Findings. Expert 2's Problem Findings mostly violated the Learnability aspect. Expert 3 did not find any Problem Findings. On the User Page, Expert 1 found 3 Problem Findings. Expert 1's Problem Findings mostly violated the Satisfaction aspect. Expert 2 and Expert 3 did not find any Problem Findings.

3.3 Problem Finding Analyis

For EP Testing, the Improvement Solutions taken are taken from the Expected Results created in each Testing Scenario. The following shows the Problem Finding Analysis for EP Testing.

Table 4 Problem Finding Analysis for Equivalence Partitioning Testing

Testing Scenario	Actual Result	Improvement Solution
Inserting Material Photos	Files can be uploaded, but there is no change to indicate that the photo file has been uploaded.	Provides notification that the Image file has been successfully uploaded.
Did not select Division	Material can be added even if the Division section is not selected.	Displays an error message that no Division has been selected.

On the Admin Page, there are 2 important improvements that need to be made. The first is to improve the features that have a Photo Input Domain. The improvement that needs to be made is to display a notification when the photo has been successfully uploaded. The second is to improve the features that display error messages, but the error messages come from Laravel. The improvement that needs to be made is to display error messages, but not from Laravel. On the User Page, the important improvement is to the Quiz feature. The Quiz feature will be redeveloped so that it can be used by Users.

For CW Testing, the Improvement Solutions taken from the analysis results of Improvement Suggestions by the three Experts. The following shows the Problem Finding Analysis for CW Testing.

Table 5 Problem Finding Analysis for Cognitive Walkthrough Testing

Testing Scenario	Evaluation Result	Problem Category	Severity Rating	Improvement Suggestions
Opening the Prama Training website	The background and text field colors tend to be the same, making the text field invisible.	Efficiency, Memorability, Learnability	2	The background color is made to contrast with the text field so that the text field is visible.

Based on the existing Problem Findings, there are several Problem Findings that intersect each other between Experts. In the Problem Findings that intersect each other, the Researcher determines the Improvement Solution by looking at the Severity Rating given. The Improvement Suggestion with the highest Severity Rating is used as the Improvement Solution. In the early stage of testing, it was found that in the Equivalence Partitioning (EP) stage 1, there were 31 failed test cases, indicating inconsistencies in the division of input equivalence classes. Meanwhile, the Cognitive Walkthrough (CW) stage 1 recorded 96 failed tasks, while stage 2 identified 12 tasks that were not completed successfully. These findings indicate that there are still multiple aspects requiring improvement to enhance system reliability. In addition, CW testing revealed variations in perception among evaluators, particularly regarding aspects such as learnability and satisfaction. To mitigate individual bias in interpreting usability issues, these differences were critically examined through evaluator triangulation. By comparing observations and rationales provided by each evaluator, both consistently problematic areas and subjectively perceived issues were identified. This approach enabled the formulation of more neutral and representative design recommendations, minimizing reliance on a single point of view. Consequently, the analysis process becomes more objective and inclusive of diverse user experiences.

3.4 Prototype Making

The Prototype of the Training Prama website was created using the Figma tool. The Prototype was created based on the Improvement Solution obtained at the Problem Finding Analysis Stage. The following shows the Prototype creation of the Training Prama website.

Figure 2 Error Message Display if you entered the wrong NIP or Password

Improvements in this section include better use of error language. Prototyping is also done in Phase 2. In Phase 2, Prototyping is done for the Front-End section.

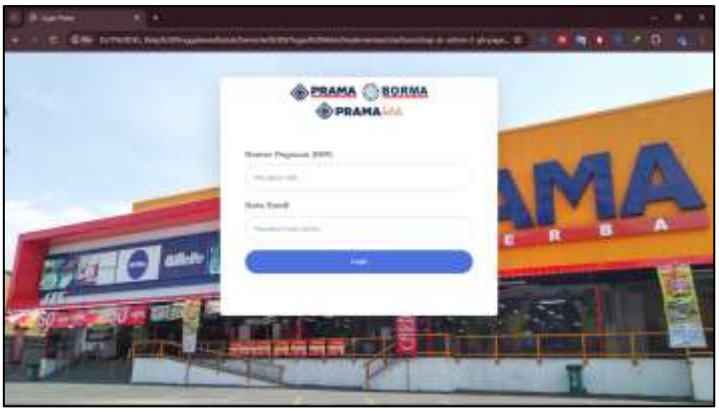

Figure 3 Login Page View after Phase 2 Fix

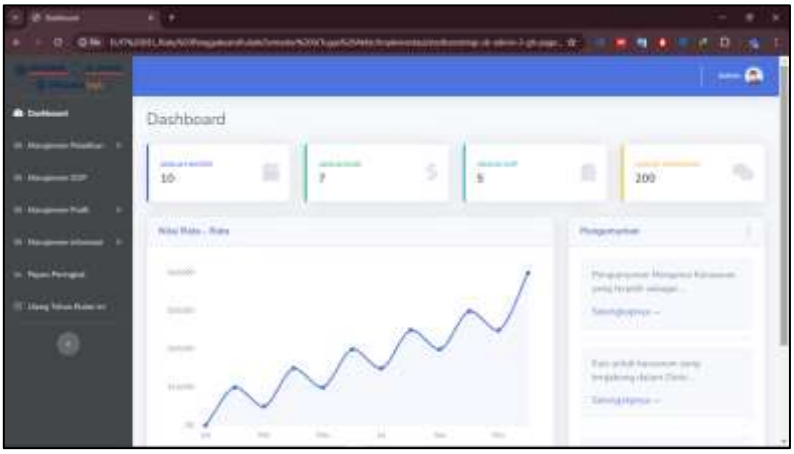

Figure 4 Dashboard Page View after Phase 2 fix

4 CONCLUSION

In the early stages of testing, it was found that in the Equivalence Partitioning (EP) test stage 1, there were 31 failed tests, indicating some inconsistencies in the division of input equivalence classes. Meanwhile, in the Cognitive Walkthrough (CW) test stage 1, 96 failed tests were found, and in the CW stage 2, there were 12 unsuccessful tests. Strategically, the development of a high-fidelity prototype, encompassing both the frontend and backend can significantly accelerate the improvement of the Prama Training system by enabling more realistic testing, reducing iteration cycles in the SDLC, and facilitating better stakeholder communication throughout the development process. Furthermore, the combination of EP and CW methods has proven effective in uncovering both functional and non-functional issues. While EP is useful for validating system logic and input handling, CW adds critical insights related to user interaction, usability, and cognitive flow. The integration of these two methods offers a more holistic evaluation than using either approach in isolation, as it addresses both system correctness and user-centered design concerns.

The implementation of the Prama Training website prototype itself has only been carried out on the Front-End section, so that testing and observation have not covered the entire system. This study is limited to front-end evaluation and expert based usability testing; therefore, future research is recommended to include end user testing and back-end system analysis for a more comprehensive assessment

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