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ResearchArticle

Black Box Testing on the Wingpos Website Using the Equivalence Partitioning Technique

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Abstract: In the digital business environment, web-based Point of Sale (POS) systems play a vital role in supporting transaction processing, inventory management, and operational decision-making. Ensuring the functional reliability of such systems is essential, particularly in critical authentication features that regulate user access. However, undetected functional errors within login and registration modules may disrupt operations, compromise data integrity, and reduce user experience quality. Therefore, this study aims to evaluate the functionality of the Wingpos website, focusing specifically on the login and registration features. The research applies the Black Box Testing approach using the Equivalence Partitioning technique, which enables systematic functional validation by classifying input data into representative valid and invalid partitions without requiring access to source code. The testing process involved designing structured test cases, executing input scenarios, and comparing actual system outputs with expected results. The findings reveal that most authentication processes function in accordance with system specifications, as seven out of ten test scenarios produced expected outcomes. Nevertheless, three discrepancies were identified, including inconsistent error message validation in the login feature and the system's inability to properly verify invalid email domains during registration. These results indicate that while the system demonstrates general functional reliability, certain validation mechanisms require refinement. In conclusion, the application of Black Box Testing with the Equivalence Partitioning technique proves effective in identifying functional gaps and supporting quality assurance processes in web-based POS systems, particularly in strengthening authentication feature reliability and improving overall system performance.

Keywords: Black Box Testing; Functional Testing; Equivalence Partitioning; POS System; Software Testing

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1. Introduction

In today's digital era, the ability to manage sales transactions effectively and efficiently has become a crucial aspect of achieving business success. An integrated Point of Sale (POS) system provides a comprehensive solution that not only facilitates transaction recording but also supports inventory management, sales reporting, and data analysis (Geni et al. 2024). The implementation of such systems enables businesses to streamline operational processes and improve data-driven decision-making. However, within the software development lifecycle, the presence of errors or bugs can have serious implications, affecting both operational continuity and system security (Ahamed & Rahman, 2023). Consequently, the software testing phase plays a vital role in ensuring system reliability and performance (Choudhary & Charan, 2023). Over time, software testing has evolved into a complex discipline encompassing various methods and techniques designed to detect defects and validate system functionality (Abdillah et al. 2024).

This study aims to evaluate the quality and functionality of the Wingpos website by applying the Black Box Testing method, which is used to assess software functionality by

examining whether system outputs correspond to expected results based on given inputs (Sari 2019). The testing process is further supported by the Equivalence Partitioning approach, which emphasizes functional testing by categorizing input data into representative partitions to improve testing efficiency (Fadhilasari et al. 2024). The main motivation of this research is to contribute to the development of efficient and reliable POS systems that effectively support business decision-making processes (Christian & Widiatry, 2023). By addressing gaps in system testing and validation, this study is expected to enhance user experience and overall business efficiency (Agil Sakinah et al. 2024a).

Through this testing implementation, the research not only provides technical insights into the software quality of the Wingpos system but also proposes a systematic approach to web-based software testing (Samdono et al. 2024). The findings are expected to serve as a reference for the future development of similar systems, particularly in applying the Black Box Testing method to evaluate the functionality and reliability of critical features such as login and registration (Bhat & Quadri, 2021; Gupta & Sharma, 2021). The novelty of this study lies in the application of the Equivalence Partitioning technique within Black Box Testing, specifically for evaluating critical authentication features in a web-based POS system environment. This research offers a structured functional testing framework that emphasizes input partition efficiency while ensuring system reliability, thereby contributing to the advancement of software testing practices for POS platforms.

2. Literature Review

2.1. Black Box Testing

Black Box Testing is a software testing method that focuses on the external functions of the software without examining its internal code (Amrullah & Setiawan, 2021; Andriansyah et al., 2022). This method aims to verify whether the software operates according to the specified requirements. One of the main advantages of Black Box Testing is its simplicity in identifying errors at the input-output level without requiring an in-depth understanding of the application's internal structure (Sari, 2019; Mahendra & Saputra, 2022). This testing technique is commonly used in various application scenarios, such as e-commerce systems, web-based applications, and enterprise software. Previous studies have demonstrated that Black Box Testing is effective in detecting functional errors, including input validation, data processing, and incorrect outputs (Abdillah et al. 2024b).

2.2 Equivalence Partitioning Technique

Equivalence Partitioning is a technique within Black Box Testing that divides test data into several groups or partitions based on similar characteristics (Alqahtani & Khan, 2022; Lestari & Firmansyah, 2023). This technique enables more efficient testing by requiring only one test case from each partition to verify the entire group of data. This technique is particularly useful for testing web-based applications, especially in scenarios involving user input such as login and registration. Using Equivalence Partitioning, testers can identify input validation limits, which often pose security vulnerabilities or functional errors (Fadhilasari et al. 2024).

2.3 The Importance of POS System Testing

Point of Sale (POS) systems play a crucial role in modern businesses by handling transactions, inventory, and sales data analysis. Mistakes in these systems can have a major impact on business operations, including the loss of transaction data or disruptions in inventory management. Based on the research in the journal, errors in POS systems can undermine their functionality, making effective testing, such as Black Box Testing with Equivalence Partitioning, essential for identifying potential issues in processes like transaction handling, data integrity, and inventory tracking (Candy dan Joycelin 2024).

Software testing for POS systems must include functional and security testing due to the sensitive data being processed. Based on the research in this journal, Black Box Testing, particularly using the Equivalence Partitioning technique, is effective in identifying weaknesses in processes such as login, registration, and transaction data management. This approach focuses on verifying the system's functionality without accessing the internal code (Rahmawati & Utomo, 2023; Nugraha & Kusuma, 2024), ensuring that transactions are processed correctly and securely while protecting sensitive data from potential security vulnerabilities (Handono et al., 2024).

Previous studies have shown that Black Box Testing has been applied to various applications with positive results. (Agil Sakinah et al. 2024b) found that the Equivalence Partitioning technique effectively reduces the number of test cases in asset management applications without sacrificing test coverage. Meanwhile, (Fadhilasari et al. 2024) used this method to identify input validation errors in search, checkout, and login features on e-commerce platforms. Additionally, (Abdillah et al. 2024b) highlighted the role of Black Box Testing in detecting errors in inventory information systems, particularly in recording and tracking processes.

However, most studies have focused on e-commerce and asset management applications, while web-based POS systems have received less attention. Furthermore, specific input validation, such as email format and password length, is often overlooked in testing login and registration features. This study aims to address these gaps by applying Black Box Testing using the Equivalence Partitioning technique to the Wingpos POS system. This approach is expected to detect functional errors and improve input validation, thus contributing to the advancement of testing methods for web-based POS systems.

3. Method

This research employs a Black Box Testing approach utilizing the Equivalence Partitioning technique to evaluate the functionality of the login and registration features on the Wingpos website. The Black Box method was selected because it enables functional testing based on system inputs and outputs without requiring access to the application's source code. This approach ensures that testing is conducted from the user's perspective, focusing on validating whether system behavior aligns with specified functional requirements (Ismail & Prabowo, 2022; Jaya & Wibowo, 2021).

The research procedure consists of several stages. The first stage involves the analysis of testing requirements to identify the functional components and input fields within the login and registration modules. The second stage is the design of test cases, conducted by classifying input data into valid and invalid equivalence partitions to ensure representative test coverage while minimizing redundant testing scenarios. The third stage involves test execution, where predefined input data are entered into the system, and the resulting outputs are observed and compared with expected outcomes.

Following the execution phase, the test results are evaluated to determine whether the system meets established functional specifications. Any discrepancies between expected and actual results are documented as findings for system refinement. Finally, all testing outcomes are systematically recorded to support further improvement, validation, and decision-making processes by the development team.

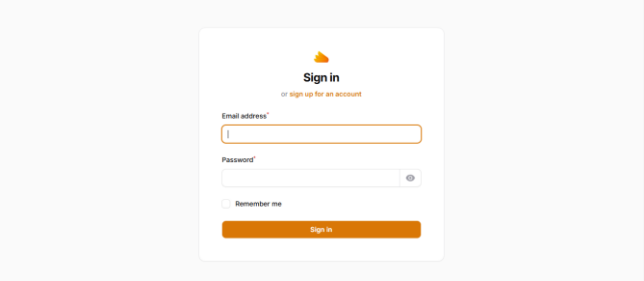

Figure 1. Login Page

Figure 1 illustrates the overall research flow employed in this study. The process begins with the identification of system requirements, focusing on determining the functional scope of the Wingpos website, particularly the login and registration features. Following this, test requirement analysis is conducted to define input variables and validation rules. The next stage involves designing test cases using the Equivalence Partitioning technique, where input data are grouped into valid and invalid partitions. After the test scenarios are established, the testing process is executed by entering test data into the system interface. The system responses are then recorded and compared with expected outputs. The final stages include evaluation and documentation, where testing results are analyzed to identify functional conformity or defects. All findings are compiled to support system improvement and to ensure that the tested features meet functional quality standards.

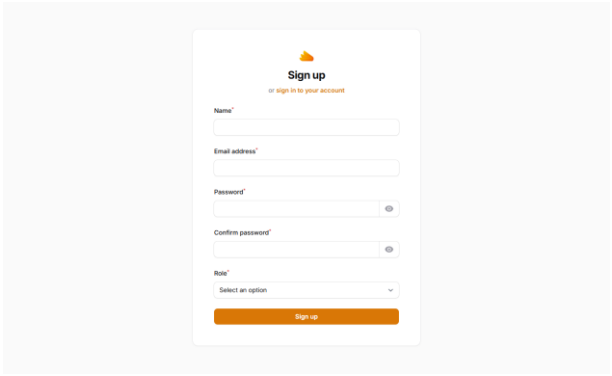

Figure 2. Register Page

Figure 2 presents the structure of the test case design based on the Equivalence Partitioning technique. The figure demonstrates how input fields within the login and registration forms are divided into representative data classes. Each input variable, such as username, email, and password, is categorized into Valid partitions (data that meet system requirements) and Invalid partitions (data that violate validation rules). By applying this partitioning model, the testing process becomes more efficient because a single test case can represent multiple data possibilities within the same class. This approach ensures adequate functional coverage while reducing the total number of test scenarios required.

4. Results and Discussion

4.1. Result

The results of this study were obtained through the execution of Black Box Testing using the Equivalence Partitioning technique on the login and registration features of the Wingpos website. Testing was carried out by applying predefined test cases derived from valid and invalid input data partitions. Each test scenario aimed to evaluate whether the system's functional responses were consistent with the expected outputs based on system validation rules.

Table 1. Black Box Test Scenario for Login and Register Forms

Test Code	Test Scenario	Expected Results	Actual Result	Conclusion
WINGSPOS-001	Login without entering both Email and Password	The system should reject and display the message: "Please enter username and password."	The system only displays an alert on the username field with the message: "Please fill out this field."	Does Not Match
WINGSPOS-002	Login by entering your email, but leaving the password empty	The system should reject and display a message indicating the Password field is required.	Displays an alert on the password field: "Please fill out this field."	Match
WINGSPOS-003	Login by entering the password, but leaving the email empty	The system should reject and display a message indicating the Email field is required.	An alert appears on the username field: "These credentials do not match our records."	Match
WINGSPOS-004	Login with incorrect Username and/or Password	The system should reject and display a message: "The username or password entered is incorrect."	Alert appears only on the username field: "These credentials do not match our records."	Does Not Match

WINGSPOS-005	Login with a valid Username and Password	The system should allow login and display the dashboard page.	Successfully logs in and displays the dashboard page.	Match
WINGSPOS-006	Register a new account	Redirects to the dashboard with a message indicating the account was successfully created.	Redirects to the dashboard.	Match
WINGSPOS-007	Register with an already registered account	Redirects back to the registration page with a message indicating the account already exists.	Redirects to the registration page with the message: "The email address has already been taken."	Match
WINGSPOS-008	Register with an invalid email domain	Redirects back to the registration page with a message indicating the email is invalid.	Logs into the dashboard without displaying an invalid email message.	Does Not Match
WINGSPOS-009	Register with a password less than 8 characters	Redirects back to the registration page with a message indicating the password must be at least 8 characters long.	Redirects to the registration page with the message: "The password field must be at least 8 characters."	Match
WINGSPOS-010	Register with one or more empty input fields	Redirects back to the registration page with a message indicating the required fields must be filled.	Redirects to the registration page with the message: "Please fill out this field."	Match

4.2. Discussion

The functional evaluation of the Wingpos website's authentication modules was conducted using Black Box Testing with the Equivalence Partitioning technique. This approach enabled systematic validation of input data classifications across the login and registration features. Based on the results illustrated in Figure 3, a total of ten test scenarios were executed, of which seven test results were consistent with the expected system outcomes, while three test results did not meet the predefined expectations.

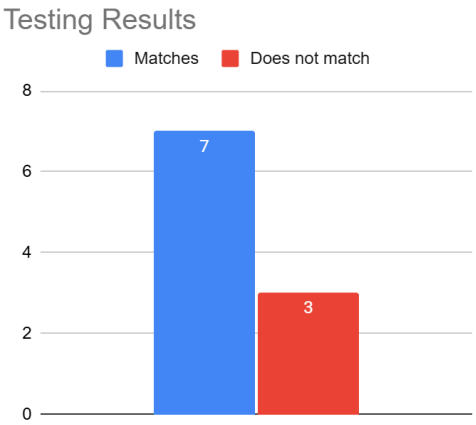

Figure 3. Testing Results Chart

In the login feature, several discrepancies were identified. Specifically, in test codes WINGPOS-001 and WINGPOS-004, the system generated validation error messages only for the email field, whereas no corresponding error messages were displayed for the password field. This indicates that the system's input validation mechanism does not fully enforce field-level error handling when multiple invalid inputs are submitted simultaneously. Despite these findings, the remaining login test scenarios demonstrated functional conformity with the expected validation logic.

Meanwhile, within the registration feature, only one test case produced results that were inconsistent with the expected outcome, namely, test ID WINGPOS-008. In this scenario, the system failed to validate the correctness of the email domain entered by the user. As a result, users were able to register accounts using email addresses with invalid or non-existent domains. This finding highlights a gap in the system's email verification rules, which may affect data integrity and user authentication reliability. Overall, the results presented in Figure 3 indicate that the majority of authentication functions operate according to system specifications. However, the identified validation gaps suggest the need for refinement in input verification mechanisms, particularly in multi-field error handling and email domain validation, to enhance system reliability and security.

6. Conclusion

This study presents the results of functional evaluation of the Wingpos website, focusing on the login and registration features through the implementation of Black Box Testing with the Equivalence Partitioning technique. The findings indicate that the majority of test scenarios produced outputs consistent with expected system specifications, confirming that the authentication mechanisms generally function reliably in processing valid and invalid input data. However, several discrepancies were identified, including inconsistent validation error messages in the login feature and the system's inability to properly verify invalid email domains during registration. These results demonstrate that the research objective—to evaluate system functionality and identify validation gaps—has been successfully achieved. The findings further emphasize the importance of systematic functional testing in improving software reliability, user experience, and access control integrity within web-based Point of Sale systems. From a practical perspective, this study contributes to software quality assurance practices by providing structured testing insights that may support developers in refining validation mechanisms. Nevertheless, this research is limited by its testing scope, which only covers authentication features, the absence of in-depth root cause analysis, reliance on manual testing procedures, and controlled testing conditions that may not fully represent real-world environments. Therefore, future research is recommended to expand testing coverage to additional system modules and to incorporate complementary and automated testing approaches to obtain more comprehensive and scalable evaluation results.

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