


Functional Testing of The Dana E-Wallet Transaction Features Using Black Box Testing

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Article Info	ABSTRACT
<p>Keywords: Blackbox testing, Equivalence Partitioning, Boundary Value Analysis, E-wallet, Functional Testing</p>	<p>The rapid development of financial technology in Indonesia has driven the adoption of digital wallet applications such as DANA, which offers various digital transaction features. However, the high usage rate is not always accompanied by guaranteed functional reliability of the application. This study aims to test the functionality of transaction features in the DANA application through a quantitative approach using the black box testing method. The research design is descriptive quantitative, utilizing 20 test scenarios developed based on Equivalence Partitioning (EP) and Boundary Value Analysis (BVA) techniques, with sampled transaction features including login, PIN verification, money transfer, adding a bank account, and requesting money. The analysis technique involves calculating the number of valid and invalid scenarios based on the match between the actual output and the expected output. The results show that 14 out of 20 scenarios (70%) performed as expected, while the remaining six failed, with most failures found in the login and PIN verification features. These findings highlight weaknesses in the input validation system and insufficiently informative error notifications. This study makes an important contribution to the development of e-wallet applications, particularly in improving validation quality, authentication security, and the overall user experience.</p>
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INTRODUCTION

The advancement of digital technology in Indonesia has driven major changes in people's financial transaction patterns. One of the most prominent innovations is the increasing use of digital wallets (e-wallets), where the DANA application is one of the leading platforms that facilitates bill payments, credit purchases, and interbank transfers practically and quickly (Dwijayanti, Santoso and Hantono, 2021). This phenomenon is supported by changes in people's lifestyles towards non-cash transactions, in line with increasing digital literacy and smartphone penetration.

The millennial generation as the dominant group of digital wallet users is the main driver of this transformation. Based on the Ipsos Indonesia report (2020), around 68% of e-wallet

users in Indonesia are millennials. This trend is in line with the findings of (Hidayanto *et al.*, 2015), which states that ease of access, efficiency, and speed of service are key factors driving the adoption of digital payment systems.

The significant growth in the use of digital wallets in Indonesia also presents challenges to the reliability and security aspects of application systems. Various studies emphasize the importance of software testing as a preventive measure to minimize the risk of system failures, bugs, and input errors that can affect user trust (Putra, Rahma and Wahyuni, 2024).

The Black Box Testing method is one of the effective approaches to evaluate application functionality without needing to know the internal structure of the program code. Several studies have shown that Black Box Testing with Equivalence Partitioning and Boundary Value Analysis techniques can identify software defects that may occur due to variations in user input, including extreme inputs that often escape routine testing (Kusuma, Yuhana and Informatika, 2024) dan (Briliansyah and Avianto, 2024).

In addition, the aspect of system reliability in digital payment applications has been shown to influence users' continued intention to continue using the service (Duy Phuong *et al.*, 2020) dan (Koo and Cuandra, 2022). Factors such as trust, perceived performance, and user experience are important indicators that are interrelated with the functional quality of the system (Zaid Kilani *et al.*, 2023).

Although previous studies have reviewed consumer behavior, user satisfaction, and technology adoption factors in the context of digital wallets (Dwijayanti, Santoso and Hantono, 2021) dan (Duy Phuong *et al.*, 2020), research that specifically tests the functional reliability of e-wallet systems through the Black Box Testing approach, especially on the DANA application, is still very limited. Previous studies have focused more on aspects of user behavior without examining the technical performance of the application, such as system response to extreme input, transaction value limits, and usage scenarios in complex conditions (Permatasari *et al.*, 2023) dan (Pusparani, Setiyorini and Frieyadie, 2023). In fact, these aspects greatly determine the reliability of the application in meeting user needs in the dynamic real world.

Based on the identification of research gaps, this study aims to test the reliability of transaction features on the DANA application using the Black Box Testing method with the Equivalence Partitioning and Boundary Value Analysis approaches. This test is designed to evaluate the system's resilience to various input variations, including minimum, maximum, and extreme condition inputs. The results of this study are expected to provide theoretical contributions in the form of strengthening studies on the application of the Black Box Testing method in software testing for digital wallet applications. In addition, practically, this study can be a reference for DANA application developers and other e-wallets to improve system reliability, strengthen input validation, and minimize operational risks that can reduce user trust levels (Hamzah, Ramli and Shaw, 2023).

METHODS

This study uses a descriptive quantitative approach to evaluate the extent to which the transaction features on the DANA digital wallet application function according to user

expectations. The evaluation was carried out using the Black Box Testing method, which is a testing technique that focuses on the relationship between system input and output, without examining the internal structure of the software. This approach is considered appropriate for function-based testing because its main focus is to match actual results with expected results based on input scenarios that have been systematically designed (Ayu *et al.*, 2022).

The population in this study includes all transaction features available in the DANA application, including login features, PIN verification, fund transfers, adding bank accounts, and fund requests. However, not all features are sampled for efficiency and methodological suitability. The purposive sampling technique is used to select features that have clear input boundaries and are relevant to the testing approach applied, namely the Equivalence Partitioning (EP) and Boundary Value Analysis (BVA) techniques. EP is useful for grouping input into valid and invalid classes so that the test coverage remains representative even though it is efficient. This technique is effective in accelerating the testing process when the input variations are large while maintaining meaningful coverage. On the other hand, BVA focuses on testing input values that are at the lower and upper limits, considering that these points are often the source of system errors (Frayudha, Pande and Juwita, 2024).

The main instrument in data collection is a test case sheet that is prepared based on the technical specifications of the system. Each test sheet lists input data, expected output, actual results of the system, test pass status (pass/fail), and additional notes if there are differences in results. To ensure the validity of the test scenario, each test case is first reviewed by a software testing expert using a scenario-based review approach, which is a review method based on real-use scenarios in the context of information systems (Ali *et al.*, 2020).

The testing stages start from (1) formulating the problem and testing needs, (2) compiling a test scenario based on EP and BVA techniques, (3) conducting testing on selected features, and (4) documenting and analyzing the test results. All features are tested with varying combinations of inputs, according to the equivalence class and predetermined limit values, in order to identify possible system errors from various angles.

The test result data was analyzed quantitatively-descriptively, by calculating the number of successful (pass) and failed (fail) scenarios, then presented in the form of a percentage of the success rate of each feature (Santika *et al.*, 2025). Because the testing carried out was deterministic meaning that every identical input would produce identical output testing the validity and reliability of the instrument was not necessary. This is in line with the basic principle of functional testing which assesses system performance based on concrete results, not subjective perceptions (Wicaksono, 2025). To improve the accuracy of the results, testing was also carried out on various types of devices with different specifications, as well as in varying internet network conditions, both via Wi-Fi connections and cellular data.

This approach aims to simulate real usage situations faced by users. All test results are summarized in the form of a summary table, including input, expected output, actual results, test status, and notes if there are anomalies. Features that show a high failure rate will be prioritized in further evaluation by the development team. Thus, this testing is not only

systematic and measurable, but can also be the basis for technical decision-making in order to continuously improve the quality and reliability of digital wallet application services.

RESULTS AND DISCUSSION

Results

Testing was conducted on five core features in the DANA application: Login, PIN Verification, Send Money, Add Bank Account, and Request Money. Each feature was tested using four distinct scenarios, totaling 20 test cases. These scenarios included a combination of valid inputs, invalid inputs, and inputs at the lower and upper boundary limits, based on the principles of Equivalence Partitioning (EP) and Boundary Value Analysis (BVA).

Table 1. Functional Testing Test Cases for the DANA E-Wallet Transaction Features

Test Case ID	Transactions Feature	Test Scenario	Input	Expected Output	Model	Status
TC-1	Login	Login with a valid phone number	0838xxxxxx74	Login successful	EP	✓
TC-2	Login	Login with incorrect password	0838xxxxxx74 / wrong123	Login failed	EP	✗
TC-3	Login	Password exactly 8 characters	abcdefgh	Login successful	BVA	✓
TC-4	Login	Password less than 8 characters	abcdefg	Login failed	BVA	✗
TC-5	PIN Verification	Valid 6-digit PIN	121312	Verification successful	EP	✓
TC-6	PIN Verification	Incorrect PIN	654321	Verification failed	EP	✗
TC-7	PIN Verification	PIN exactly 6 digits	000000	Verification successful	BVA	✓
TC-8	PIN Verification	PIN less than 6 digits	12345	Verification failed	BVA	✗
TC-9	Send Money	Valid amount and registered target number	Rp50.000 to 0895xxxxxxxx9	Transaction successful	EP	✓
TC-10	Send Money	Amount at minimum limit	Rp10.000	Transaction successful	BVA	✓
TC-11	Send Money	Amount at maximum limit	Rp10.000.000	Transaction successful	BVA	✓
TC-12	Send Money	Send to active account	Rp100.000 to contact A	Transaction successful	EP	✓

Test Case ID	Transactions Feature	Test Scenario	Input	Expected Output	Model	Status
TC-13	Add Bank Account	Valid account number	BTN xxxxxxxxxxxx346	Account added	EP	✓
TC-14	Add Bank Account	Account number contains letters	53424abcd	Add account failed	EP	✗
TC-15	Add Bank Account	10-digit account number (valid boundary)	BTN xxxxxxxxxxxx879	Account added	BVA	✓
TC-16	Add Bank Account	Account number less than 10 digits	BCA xxxxxx345	Add account failed	BVA	✗
TC-17	Request Money	Valid amount and active contact	Rp20.000 to Rifa	Request successful	EP	✓
TC-18	Request Money	Request to active DANA account	Rp50.000 to Eva	Request successful	EP	✓
TC-19	Request Money	Request at minimum limit	Rp10.000	Request successful	BVA	✓
TC-20	Request Money	Request at maximum limit	Rp5.000.000	Request successful	BVA	✓

From the 20 scenarios tested, 14 test cases passed, and 6 failed, yielding a total success rate of 70%.

Table 2. Summary of DANA Transaction Feature Testing Results

No	Feature Tested	Number of Scenarios	Valid (Passed)	Invalid (Failed)	Success Rate
1	Login	4	2	2	50%
2	PIN Verification	4	2	2	50%
3	Send Money	4	4	0	100%
4	Add Bank Account	4	2	2	50%
5	Request Money	4	4	0	100%
	Total	20	14	6	70%

The Send Money and Request Money features achieved full marks with a 100% success rate, indicating robust system performance even with boundary inputs. Meanwhile, the Login, PIN Verification, and Add Bank Account features showed only a 50% success rate, signaling potential flaws in validation or user feedback mechanisms.

Discussion

The test results indicate that while the DANA application performs well in core financial transactions such as sending and requesting money, some of its supporting features still need refinement. The Login and PIN Verification features failed in scenarios involving incorrect or incomplete input. This suggests a lack of proper error handling and feedback mechanisms. For instance, the system did not clearly inform users about why login attempts failed or

whether a temporary lock was triggered after multiple failed attempts. These are critical issues related to security and user experience that must be addressed.

Similarly, the Add Bank Account feature, while successfully rejecting invalid input such as letters or too-short account numbers, did not provide guidance to the user about the correct input format. The lack of real-time validation feedback could hinder users from successfully completing the registration process, especially those unfamiliar with bank account formatting standards. In contrast, the Send Money and Request Money features demonstrated stability and adaptability across a variety of inputs. These results align with the application's core functionality and support its reliability as a digital financial service. The system successfully handled boundary-value inputs, such as minimum and maximum transaction limits, which are often critical failure points in financial systems.

In conclusion, although the majority of features tested worked as expected, certain areas related to authentication and input validation still require improvement. Strengthening these aspects can significantly enhance both the security and usability of the DANA application, ensuring a more reliable experience for users across diverse usage scenarios.

CONCLUSION

Based on the results of 20 test scenarios conducted on transaction features in the DANA e-wallet application, 70% of the features functioned as expected. The “Send Money” and “Request Money” features showed the highest success rate (100%), while the “Login,” “PIN Verification,” and “Add Bank Account” features each showed a 50% success rate. These findings confirm that functional testing is effective in identifying weaknesses in input validation and security processes. The results also reinforce previous studies showing that extreme or boundary inputs often expose vulnerabilities in system logic. This study contributes both theoretically by demonstrating the applicability of structured functional testing approaches—and practically, by providing actionable insights for developers to improve user experience and reliability in digital wallet applications. For future research, several improvements are recommended. First, the literature review on functional testing in the context of e-wallets should be expanded to strengthen the theoretical framework. Second, each tested feature should be described in more detail, including its workflow and possible risks in case of failure. Third, the use of illustrations such as scenario diagrams or boundary charts can help clarify testing techniques. Fourth, testing should be supported by expert validation or conducted under extreme conditions, such as weak network signals or insufficient balances. Lastly, future studies are encouraged to explore non-functional aspects such as usability, performance, and security to provide a more comprehensive evaluation of e-wallet systems

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