

Implementation of Black Box Testing and System Usability Scale on the Nurul Huda Financial Recording Information System

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Abstract

This study was conducted to evaluate the performance of the Nurul Huda Foundation's financial recording information system using two assessment methods: Black Box Testing and usability measurement through the System Usability Scale (SUS). Black Box Testing was applied to ensure that all system features operate as intended, while usability testing was carried out to determine the level of comfort and ease experienced by users when interacting with the system. The results of the Black Box Testing indicate that out of 111 test scenarios, 89 passed successfully and 22 experienced minor failures that remain within acceptable improvement limits. Meanwhile, the usability testing involving 20 respondents produced an average SUS score of 84.5, demonstrating that the system meets the criteria of being user-friendly and positively received by users. Based on SUS interpretation guidelines by Bangor, this score falls into Grade A with an "Excellent" rating, is categorized as "Acceptable," and is classified under the Net Promoter Score (NPS) group of "Promoter".



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I. INTRODUCTION

Black Box Testing is a software testing methodology that evaluates a system's functionality from an external perspective. This approach focuses on validating system outputs based on given inputs without requiring knowledge of the internal code structure or implementation details. The system is treated as a "black box," where testers do not examine the internal workings but only assess whether the system behaves

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according to its functional specifications. The primary objective of this method is to ensure that the system produces acceptable outputs aligned with user and client requirements, as emphasized in [1]. This type of testing is essential for identifying errors related to functions, interfaces, data models, and access to external data sources.

The System Usability Scale (SUS) is a global usability measurement method designed to capture users' perceptions regarding the ease of use of a system. Introduced by Brooke, SUS offers a quick, simple, yet reliable method for assessing usability characteristics from the user's viewpoint [7]. Its main strength lies in its simplicity and ability to provide a clear indication of whether a system is considered usable and efficient by its users. Supporting studies, such as those by Bangor et al. [2], Lewis and Sauro [3], and subsequent research, have validated SUS as a widely accepted usability evaluation tool.

In the context of religious-based educational institutions such as Yayasan Pondok Pesantren Nurul Huda, information systems that support foundation operations have become increasingly important. One critical aspect that has not been fully digitized is the management of internal financial records. Activities such as transaction logging, monthly financial reporting, and budget monitoring for educational units have been conducted manually, resulting in risks including data entry errors, delayed reporting, and reduced efficiency. Similar challenges in manual financial administration have been documented in previous studies on digital transformation in educational institutions [8]–[12].

To address these limitations, a web-based financial recording information system was developed to simplify and enhance the efficiency of financial administration within the Nurul Huda Foundation. This system is designed with a simple user interface, automated recording and reporting features, and role-based access controls for different types of users. Before large-scale implementation, the system underwent comprehensive evaluation through Black Box Testing to verify system functionality, while the System Usability Scale (SUS) was used to measure the level of convenience and ease of use from the end-user perspective. The importance of combining technical and usability evaluation methods in system development has also been highlighted in earlier research [4], [5], [13]–[17].

By integrating these two evaluation approaches, this study aims to assess the system's overall quality—both in terms of technical performance and user experience—so that the financial recording information system is fully ready for operational deployment within the Nurul Huda Islamic Boarding School Foundation.

II. METHODS

This study aims to evaluate the quality of the Financial Recording System of the Nurul Huda Foundation, both in terms of functionality and user convenience. The evaluation was conducted using two primary approaches: Black Box Testing for functional testing and the System Usability Scale (SUS) for usability testing. The study also includes an analysis of the test results to provide a comprehensive conclusion regarding the system's feasibility.

A. *Black Box Testing Method*

Black Box Testing is a software testing approach that focuses on verifying system functions based on their specifications without referring to the internal structure of the program [1]. In this study, testing was carried out on several core features of the financial recording information system, including user management, income recording, cash management, academic year settings, student data, and other related features.

Each feature was tested based on predefined test scenarios corresponding to its functional requirements. The actual output of each process was then compared with the expected output. If the actual result matched

the expected outcome, the feature was considered to have passed the test. Conversely, if discrepancies were found, the result was recorded as a failure and further analyzed to determine necessary improvements.

B. Usability Testing Method

To measure the comfort and ease of use of the system, the System Usability Scale (SUS) method was employed. SUS is a fast, simple, and widely used usability measurement tool in evaluating software systems. Developed by John Brooke (1996), this method consists of 10 statements answered by respondents on a 5-point Likert scale, with odd-numbered statements being positive and even-numbered statements being negative, as illustrated in the figure below:

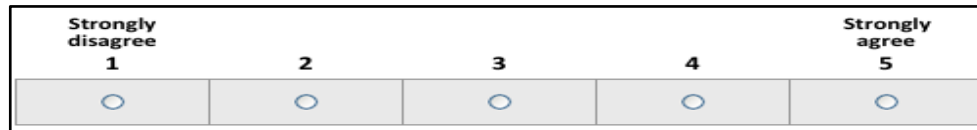


Figure 1. Likert Scale

The calculation of the SUS score is carried out using the following steps:

- For odd-numbered statements, the score is reduced by 1.
- For even-numbered statements, the score is calculated as 5 minus the given value.
- The total score from all statements is then multiplied by 2.5.
- The final SUS score will fall within the range of 0 to 100.

After obtaining the SUS score from each respondent, the next step is to interpret the average score using the approach developed by Bangor, Kortum, and Miller (2009) [2]. This approach aims to provide deeper meaning to the numerical score by categorizing it into four evaluation dimensions:

1. Grade is a letter-based quality rating,
2. Adjective Rating is a descriptive assessment based on user perception,
3. Acceptability is the degree to which a system is considered suitable for use, and
4. Net Promoter Score (NPS) is an indicator of how likely users are to recommend the system to others.

Through this interpretative model, the final SUS score does not merely represent a numerical value but also conveys a broader picture of user satisfaction and overall perception of the system's usability. A complete representation of the SUS interpretation scale can be seen in the following illustration.

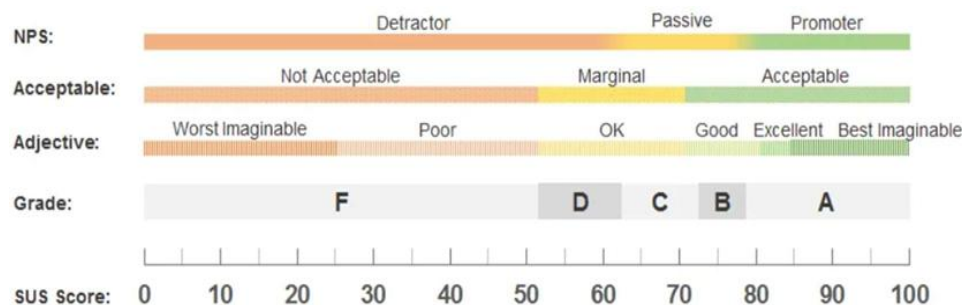


Figure 2. SUS Score Interpretation Scale

As additional clarification, Table 1 below presents the interpretation categories based on SUS scores:

Table 1. SUS Score Interpretation Scale

<i>SUS</i>	<i>Grade</i>	<i>Adjective</i>	<i>Acceptable</i>	<i>NPS</i>
84.1 – 100	A+	Best Imaginable	Acceptable	Promoter
80.8 – 84.0	A	Excellent		
78.9 – 80.7	A-	Good to Excellent		
77.2 – 78.8	B+	Good		Passive
74.1 – 77.1	B			
71.1 – 74.0	B-			
65.0 – 71.0	C	Ok	Marginal	
51.7 – 64.9	D	Poor	Not Acceptable	Detractor
0 – 51.6	F	Worst Imaginable		

From Figure 2, we can observe that the interpretation of SUS scores can be conducted using five different approaches. The explanation for each approach is presented below (Sauro, 2018) [3].

1. Grades

This approach categorizes raw SUS scores into grade levels such as A, B, C, D, and F. Grade A reflects a system with excellent quality and high usability, whereas Grade F indicates a very poor-quality system that is not recommended for use. Systems that achieve Grades A or B are generally considered to meet usability quality standards.

2. Adjective Ratings

The adjective rating approach assigns verbal labels to the SUS score. For example, scores above 85 are categorized as *Best Imaginable*, scores in the 80s are considered *Excellent*, and scores above 70 fall under the *Good* category. Meanwhile, lower scores, such as those in the 50s, are classified as *OK* or even *Poor*. This approach helps provide a qualitative impression of the obtained usability score.

3. Acceptability Range

In this approach, SUS scores are classified based on the level of system acceptability. Scores ≥ 70 are deemed *Acceptable*, indicating that the system is satisfactory for user needs. Scores between 50–69 fall under the *Marginally Acceptable* category, meaning the system can still be used but requires improvements. Scores ≤ 50 are classified as *Not Acceptable*, indicating that the system does not meet user expectations.

4. Net Promoter Score (NPS)

This approach measures user loyalty and the likelihood of recommending the system to others. Based on SUS scores, respondents are categorized into three groups:

- Promoters (78.9–100): highly satisfied users who are very likely to recommend the system,
- Passives (62.7–78.8): neutral users who are not particularly enthusiastic,

- Detractors (≤ 62.6): dissatisfied users who are unlikely to recommend the system. This approach provides insights into the system's potential adoption and growth from a user perspective.

C. Research Workflow

To provide a clear illustration of the stages carried out in this study, a workflow diagram is used to represent the research process systematically. The workflow begins with the identification of system requirements and features, followed by the development of the financial recording information system. The next stages involve functional testing using the Black Box Testing approach and usability testing using the System Usability Scale (SUS). After all testing procedures are completed, the final stage consists of analyzing the test results to evaluate the extent to which the system meets functional and usability requirements. This workflow aims to give a comprehensive understanding of the sequence of research activities from system design to the formulation of conclusions.

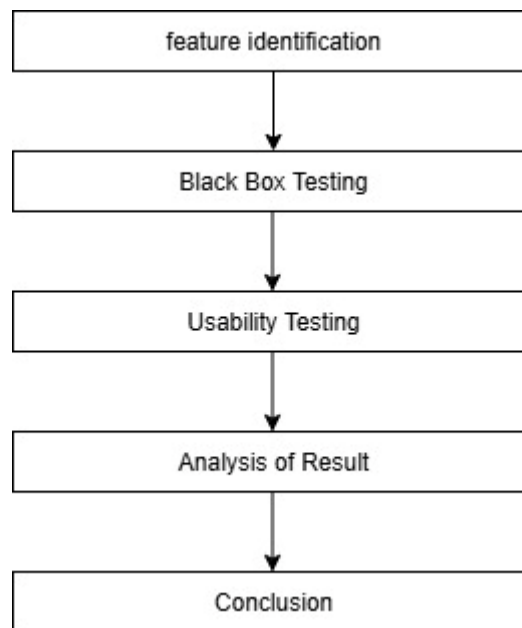


Figure 3. Research Workflow

This diagram serves as a comprehensive visual representation of the sequential stages involved in the research process. It not only clarifies the workflow but also highlights the interrelationships between each phase, starting from the initial identification of system requirements to the final conclusion drawing. By illustrating how each step is connected, the diagram helps ensure that the entire research process is easier to understand, systematically structured, and logically coherent.

Furthermore, the diagram functions as an essential reference throughout the development and evaluation of the financial recording information system. Researchers, system developers, and evaluators can rely on this diagram to maintain consistency between the planned methodology and the actual implementation. It also provides a clear overview for readers, enabling them to follow the progression of the study without ambiguity.

In addition, the diagram plays a crucial role in supporting transparency and reproducibility of the research. By documenting each stage—from system analysis, design, and development, through Black Box

Testing and usability evaluation using SUS, to the interpretation of results—the diagram ensures that future researchers or system maintainers can replicate or enhance the study with a clear understanding of its operational framework.

Overall, this diagram not only guides the execution of the research but also strengthens the quality of the final reporting. It becomes a foundational element that connects conceptual planning, technical implementation, and evaluative procedures, thereby supporting a more effective system implementation in the future.

III. RESULTS AND DISCUSSIONS

This section describes the experimental design, tools, data collection methods, and types of controls used in the study. If the research is conducted in the field, the author should also describe the research area, location, and the activities carried out. The general rule is that this section must be detailed and clear so that readers obtain sufficient foundational knowledge and techniques to replicate or further develop the study. The methods section must clearly explain how the results were obtained, provide specific procedural descriptions, and refer to established methods while identifying any deviations or modifications made.

A. Feature Identification

Before conducting functional testing using the Black Box Testing method and usability evaluation through the System Usability Scale (SUS), the initial step of this research was to identify all main features available in the financial recording information system of Yayasan Nurul Huda. This identification process aims to ensure that every system component aligns with organizational needs and supports the entire digital financial management workflow.

The system was developed to replace the previously used manual financial recording methods at the foundation and its associated educational units. With the implementation of this web-based system, financial administrative processes are expected to become more structured, efficient, and transparent. Therefore, the developed features must comprehensively support core administrative needs, including transaction recording, cash balance monitoring, student data management, and the generation of financial reports categorized by educational unit and academic year.

The features in the financial recording information system are grouped according to user modules, reflecting the distribution of roles and responsibilities within the organizational structure of Yayasan Nurul Huda. The following presents a complete list of system features identified based on user access modules:

Table 2. Features of Financial Recording System Based on User Access

No	Feature	Access
1	Manage Users	Internal
2	Manage Educational Units	Internal
3	Manage Income/Revenue	Internal
4	Manage Cash	Internal
5	Manage Student Data Classes	Internal

6	Manage Classes	Internal
7	Manage Class Transfers	Internal
8	Manage Academic Year	Internal

With the feature identification list, the testing process can be conducted systematically and comprehensively, covering all functional aspects of the developed system.

B. Black Box Testing

Black box testing was carried out to ensure that each feature in the Yayasan Nurul Huda financial record information system operates according to the defined objectives. The testing was performed on 8 main features, comprising a total of 111 test scenarios (test cases). This method does not consider the internal structure of the program but focuses on verifying the correspondence between system inputs and outputs.

Each feature was tested by creating specific test scenarios, after which the actual results were compared with the expected results. From the conducted tests, 89 scenarios passed successfully, while 22 scenarios failed and required further improvements. These findings serve as the basis for evaluating and enhancing system reliability before full implementation.

Each test scenario involved user data input and verification of the expected output. The results of this testing are presented in tabular form. Based on Table 3, the black box testing demonstrates successful outcomes for all system features tested:

Table 3. Black Box Testing

No	Feature	Test Cases
1	Manage User	34
2	Manage Educational Units	7
3	Manage Income	10
4	Manage Cash	12
5	Manage Student Data	10
6	Manage Classes	17
7	Manage Class Transfers	12
8	Manage Academic Year	9

C. *Example Test Cases*

1. Negative Test Case (Empty Academic Year):

The test was conducted by attempting to add an income record without selecting an academic year (left empty). The steps included filling out all required fields, such as payment name and educational unit, while leaving the academic year field blank. After pressing the “Save” button, the system displayed a warning pop-up stating “Academic Year not available,” and the user remained on the Add Data page. This result matched expectations, indicating that the test case successfully detected input errors and that the system’s validation mechanism worked correctly.

2. Positive Test Case (Academic Year Filled):

In this scenario, all fields were completed with correct data, including selecting an available academic year (e.g., 2025). After pressing the “Save” button, the system successfully stored the income data and displayed it on the main Manage Income page. The outcome matched expectations, so this test case was considered successful (passed).

Based on the testing of the Manage Income feature, which included two test scenarios, the process was carried out iteratively. Initially, there were issues with the academic year input validation that caused the system to respond incorrectly. Therefore, two iterations were conducted to fix and retest the system until the test results met the specified requirements. After the second iteration, all test scenarios were executed successfully, and the system provided accurate responses for each input condition. This success demonstrates that the system fulfils its functional requirements. Therefore, the financial record management system of Yayasan Nurul Huda can be considered to have passed the functional testing using the Black Box Testing approach.

The successful execution of all scenarios demonstrates that the system has fully met functional requirements. Testing also showed that user interactions with features such as login, registration, biodata entry, document submission, fee information, and selection result announcements could be performed without technical issues and provided correct responses according to the given inputs. Therefore, it can be concluded that the PPDB system has passed functional testing effectively using the Black Box Testing approach.

D. *Usability Testing Results (SUS)*

In addition to functionality, the success of an information system is strongly influenced by its usability or ease of use. For the implementation of the Nurul Huda financial record management system, usability is particularly important because the system will be used by individuals with varying technical backgrounds, such as finance admins, foundation operators, and school administrative staff.

Usability testing was conducted using the System Usability Scale (SUS), a standardized evaluation questionnaire developed by John Brooke in 1986. This method provides a fast, simple, yet reliable approach to measure users’ perceptions of comfort and ease of using a system. In this study, the SUS questionnaire was used to assess the usability quality of the financial record management system based on user perception.

Moreover, the SUS scoring method was enhanced with interpretive approaches such as adjective ratings and grade scales to facilitate analysis, as described by Bangor, Kortum, and Miller (2009) [2]. The method consists of 10 statements rated on a Likert scale from 1 to 5, where 1 indicates “Strongly Disagree” and 5 indicates “Strongly Agree.” Below is the list of SUS statements utilized in this questionnaire:

Table 4. Questionnaire Statement Items and Variables

No	Statement	Indicator
1	I think I would use this system again.	Satisfaction
2	I find this system unnecessarily complex.	Ease of Use / Complexity
3	I find this system easy to use.	Ease of Use
4	I need help from others or technical support to use this system.	Learnability
5	I feel that the system features work as intended.	Efficiency
6	I feel there are many inconsistencies in the system.	Consistency
7	I feel others would quickly learn how to use this system.	Learnability
8	I find the system confusing.	Learnability / Ease of Use
9	I feel there are no obstacles in using this system.	Ease of Use / Efficiency
10	I need to get accustomed before using this system.	Learnability

In this study, the System Usability Scale (SUS) questionnaire was completed by 20 respondents. Each respondent was asked to evaluate the 10 statements included in the SUS questionnaire after using the system directly. Each response was converted into a SUS score using the official formula (Final Score = Total Score $\times$ 2.5), resulting in a value ranging from 0 to 100 for each respondent.

In the next stage, the output from each respondent was processed according to the SUS calculation formula to obtain a valid final score. The higher the score, approaching 100, the better the usability level of the system. The average SUS score across all respondents was used to determine the system's ease of use, comfort, and effectiveness based on users' direct experience.

In this study, the SUS score results were analyzed to assess whether the Nurul Huda financial recording information system met the standard criteria for usability and ease of use. This evaluation was conducted to determine the system's feasibility from the usability aspect before full-scale implementation. The responses collected from the 20 respondents regarding the Financial Recording Information System for the Information Systems Study Program are summarized as follow:

1. Respondent Characteristics

The responses obtained from the 20 potential users of the Nurul Huda financial recording system were used to evaluate the usability level of the system based on their direct experience while interacting with it. The details are presented in the following table:

Table 5. Respondent Characteristics

Status	Number of Respondents
Potential System Users	20
Total: 20 Respondent	

This testing involved a total of 20 respondents, all of whom were prospective users of the system. After the questionnaires were distributed and subsequently returned, the responses from each participant were processed using the SUS formula to calculate individual usability scores. The summarized results of these calculations will be presented in the following table, illustrating the average SUS score and the interpretation of the system's usability based on the respondents' evaluations.

2. Calculation Results

After the respondents completed the System Usability Scale (SUS) questionnaire, the scores for each participant were calculated. Each answer from statements Q1 to Q10 was converted using the standard SUS formula, then summed and multiplied by 2.5 to obtain the final score. This final value reflects the level of user satisfaction and the ease of using the system based on the participants' perceptions. The overall results of the SUS score calculations can be found in Table 6 below:

Table 6. SUS Score Calculation Results

Respondent	Calculated SUS Score										Total	Value
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10		Total (Sum × 2.5)
R1	5	3	5	3	5	3	5	3	5	3	40	100,00
R2	4	3	4	3	4	3	4	2	3	2	32	80,00
R3	4	4	4	4	4	4	4	4	4	4	40	100,00
R4	4	4	5	4	4	3	4	2	4	3	37	92,50
R5	4	3	4	4	4	3	4	3	4	5	38	95,00
R6	4	3	4	4	5	3	4	4	5	4	40	100,00
R7	4	3	3	3	3	3	3	2	4	2	30	75,00
R8	4	2	5	1	4	2	4	2	5	2	31	77,50
R9	4	3	3	2	4	3	4	2	4	2	31	77,50
R10	3	3	3	3	3	3	3	3	3	3	30	75,00

R11	3	2	4	3	4	2	4	2	4	3	31	77,50
R12	4	4	3	3	4	2	3	2	4	2	31	77,50
R13	4	3	4	3	4	2	3	2	3	2	30	75,00
R14	3	2	4	3	5	2	2	1	4	2	28	70,00
R15	4	2	5	3	4	1	4	2	5	3	33	82,50
R16	4	2	4	3	4	2	4	3	4	2	32	80,00
R17	3	3	4	3	4	3	3	3	3	3	32	80,00
R18	4	3	5	4	4	2	4	2	4	4	36	90,00
R19	3	3	4	4	3	4	4	5	5	5	40	100,00
R20	4	3	4	2	4	3	4	2	4	4	34	85,00
Average Score											33,8	84,50

Based on the calculations presented in Table 6, it can be observed that the System Usability Scale (SUS) score reached a maximum of 100.00, while the lowest score obtained was 70.00, with an overall average of 84.5. These scores were derived from responses of 20 participants to 10 statements (Q1–Q10) representing key usability aspects such as ease of use, system efficiency, user confidence, and interface consistency. Evaluation was conducted using a 1–5 Likert scale, where odd-numbered statements (Q1, Q3, Q5, Q7, Q9) are positive and contribute higher points when rated higher, while even-numbered statements (Q2, Q4, Q6, Q8, Q10) are negative and contribute higher points when rated lower.

The highest score of 100.00 was achieved by respondents who gave maximum ratings on almost all positive statements and low ratings on negative statements, reflecting an excellent user experience. Conversely, the lowest score of 70.00 is still considered good, as all respondents gave a minimum score of 70.00. This indicates that the Nurul Huda Financial Record System can be classified as easy to use, with an overall usability rating in the “Excellent” category. From these results, further data analysis can be conducted on the average score using the SUS interpretation scale developed by Bangor et al., as illustrated in Figure 4 below.

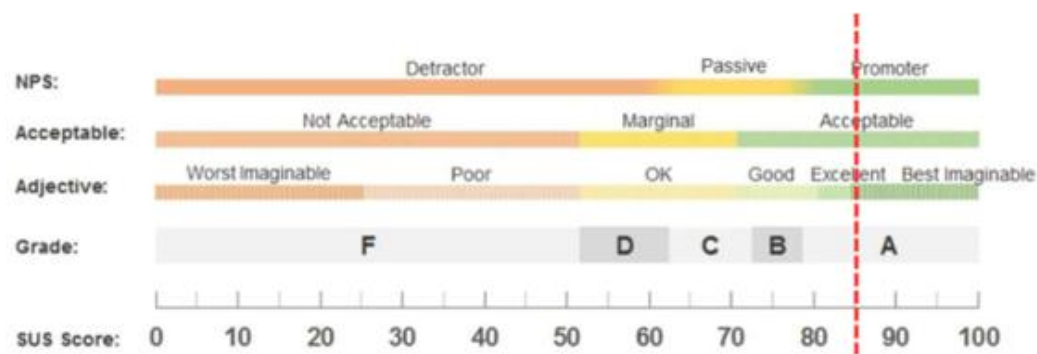


Figure 4. SUS Score Calculation Results

Based on the System Usability Scale (SUS) questionnaire completed by 20 respondents, individual scores were obtained from each participant's responses to 10 statements (Q1–Q10) using a 1–5 Likert scale. Each individual score was converted according to the SUS formula: for odd-numbered statements (Q1, Q3, Q5, Q7, Q9), the score is reduced by 1, while for even-numbered statements (Q2, Q4, Q6, Q8, Q10), the score is calculated as 5 minus the given score. The converted scores are then summed and multiplied by 2.5 to obtain the final SUS score for each respondent.

From the processed data, the total score reached 1,690. Dividing this by the number of respondents, which is 20, results in an average SUS score of 84.5. Based on SUS interpretation, this score falls into the category of Grade A, with an “Excellent” adjective rating, within the Acceptable range, and classified as a Promoter according to the Net Promoter Score (NPS) methodology:

Table 7. Interpretation of SUS Score Calculation Results

Element	Description	Details
Grade	A	This represents one of the highest usability ratings, indicating that the system is evaluated as excellent overall. Users feel satisfied and are willing to use the system again in the future.
Adjective Rating	Excellent	Users provide very positive feedback about the system. Interactions are smooth and enjoyable, reflecting a high-quality user experience.
Acceptability Range	Acceptable	The system is well-accepted by users and considered suitable for use without requiring major improvements, as it meets user needs.
NPS Category	Promoter	Indicates that users are very likely to recommend the system to others, reflecting high satisfaction and trust in the system.

Thus, it can be concluded that the average System Usability Scale (SUS) score of 84.5 indicates that the Financial Recording Information System of Yayasan Nurul Huda has achieved a very high level of usability. This score demonstrates that the system provides an efficient, comfortable, and easy-to-use user experience. Based on the SUS interpretation, the system falls under Grade A, which is the highest rating, with an Adjective Rating of Excellent, within the Acceptable range, and classified as a Promoter according to the Net Promoter Score approach. This implies that the system is not only highly accepted by users but also has strong potential to be recommended to other users. Overall, the system is considered ready for broader implementation to support the financial operations of Yayasan Nurul Huda.

IV. CONCLUSIONS

This study was conducted to evaluate the quality of the Financial Recording Information System of Yayasan Nurul Huda, focusing on two main aspects: functionality and usability. Functional testing was performed using the Black Box Testing method, while usability was evaluated using the System Usability Scale (SUS). The purpose of this evaluation was to ensure that the system not only performs well technically but also provides a user experience that is intuitive, comfortable, and aligned with the needs of prospective

users. Such an approach is essential before fully implementing the system in the foundation's financial operations.

Through Black Box Testing, a total of 111 test scenarios were executed across 8 main system features, including Manage User, Manage Revenue, Cash, Student Data, and Class Transfer. Of these, 89 test cases passed, while 22 test cases initially failed. Despite this, all testing was carried out iteratively in two rounds, ultimately resulting in a system with a 100% functional test success rate. These results indicate that the system meets the predetermined specifications and is technically ready for use. The system can accurately respond to user input and produce the expected outputs.

From the usability perspective, testing involved 20 respondents who were prospective system users. Based on the SUS questionnaire completed by the respondents, the system achieved an average score of 84.5. According to the interpretation framework by Bangor, Kortum, and Miller, this score falls into Grade A with an Excellent rating, within the Acceptable range, and is classified as a Promoter in the Net Promoter Score (NPS) framework. This means that the system is not only well-received by prospective users but is also highly satisfactory and likely to be recommended.

In conclusion, the Financial Recording Information System of Yayasan Nurul Huda has successfully met both functional and usability requirements and is ready for wider implementation to support the foundation's financial administration in an efficient, reliable, and user-friendly manner.

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