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Design and Development of a Web-Based Laundry Information System Featuring Balance Top-Up Payments and Membership Management at Pondok Pesantren Assalaam Surakarta

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ABSTRACT

The Laundry Unit of Assalaam Islamic Boarding School, Surakarta, continues to encounter challenges in managing member data, laundry transactions, payment processing, and report generation because these operational activities are handled separately. This fragmented process increases the risk of recording errors and reduces service efficiency. This study aims to develop a web-based Laundry Information System that integrates data management, balance top-up payments, pending transaction processing, and membership management to improve the effectiveness and efficiency of laundry services. The system was developed using the Waterfall software development methodology, consisting of requirements analysis, system design, implementation, testing, and maintenance. Laravel was employed as the development framework, with PHP as the programming language, MySQL as the database management system, and Unified Modeling Language (UML) for system modeling. The developed system successfully integrates student member management, laundry transaction processing, balance top-up payments, pending transaction handling, laundry staff management, receipt generation, and reporting into a single web-based application. System functionality was evaluated using Black Box Testing, which confirmed that all features operated according to the specified requirements. Furthermore, User Acceptance Testing (UAT) produced a user acceptance rate of 94.07%, indicating a high level of user satisfaction with the developed system. The implementation of the proposed system improves service speed, enhances the accuracy of data and transaction management, and increases the efficiency of report generation. These findings demonstrate that the system is suitable for implementation at the Laundry Unit of Assalaam Islamic Boarding School, Surakarta, and has the potential to support more effective and reliable operational management.

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1. INTRODUCTION

The swift evolution of digital technology has motivated educational institutions to adopt information systems to improve administrative efficiency and service excellence. Web-based information systems enable data management processes to be performed more quickly, accurately, and systematically than conventional manual methods while providing integrated and easily accessible information. The implementation of such systems also enhances business process efficiency, minimizes recording errors, accelerates information delivery, and supports decision-making through centralized data management [1], [5], [7], [31]. Consequently, the digitalization of administrative processes has become an essential requirement for educational institutions with extensive operational activities and large numbers of users to ensure effective, efficient, and well-documented service delivery [6], [9].

Based on observations conducted at Assalaam Modern Islamic Boarding School, Surakarta, the institution accommodates a large number of students and provides various supporting services, including a laundry unit responsible for handling students' laundry on a daily basis. According to the 2026 operational records, the laundry service is utilized by 1,664 active students. The existing operational activities include member registration, laundry transaction management, balance top-up, payment processing using member balances, pending transaction management when account balances are insufficient, and operational report generation. Although these activities have been supported by administrative record-keeping, the underlying data management process remains fragmented because operational data are not fully integrated into a single information system. As a result, staff are required to verify data across multiple records, leading to longer service times, an increased risk of inconsistencies between transaction records and customer balances, and difficulties in monitoring operational activities and generating timely, accurate reports.

Several previous studies have developed web-based laundry information systems to improve administrative efficiency. Arkanda and Fithri [1] proposed a system for managing

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laundry transactions, while Dayanti [6] focused on service digitalization and customer data management. However, these studies did not address the operational characteristics of laundry services in Islamic boarding schools, including the separation of male and female student management, balance-based payment mechanisms, pending transaction processing for insufficient balances, and role-based administrative access aligned with the organizational structure. These limitations indicate that existing studies have not adequately addressed the specific operational requirements of boarding school laundry services.

Therefore, this research creates an Web-Based Laundry Information System with Balance Top-Up Payment and Membership Management features for the Laundry Unit of Assalaam Islamic Boarding School, Surakarta. The application was engineered utilizing the Waterfall software construction strategy, the Laravel framework, and a MySQL database. It integrates all operational activities, including member management, laundry transaction processing, payment administration, pending transaction handling, and reporting into a centralized web-based application. The planned application is projected to improve the effectiveness, efficiency, accuracy, and transparency of administrative processes while enhancing the overall quality of laundry services at the Assalaam Islamic Boarding School Laundry Unit.

2. RESEARCH METHOD

Information systems play an important role in improving organizational efficiency by integrating data management and business processes into a centralized platform. In laundry services, web-based information systems facilitate member registration, transaction and pending processing, balance management, receipt generation, and reporting, thereby reducing manual work and improving data accuracy. Previous studies have shown that web-based laundry information systems enhance administrative performance and service quality. However, existing studies have not adequately addressed the operational requirements of Islamic boarding schools, such as gender-based member management, balance-based payments, pending transaction handling, and role-based access control. Therefore, this study develops an online laundry management application utilizing the Waterfall development procedure, Laravel framework, and MySQL database to support integrated, efficient, and reliable laundry service management.

This research applied the Waterfall software development model because it delivers an orderly and progressive method for developing software. The research stages consisted comprising needs evaluation, application blueprinting, realization, validation, and upkeep. Evidence was amassed via field observation, interviews, and documentation at the Laundry Unit of Pondok Pesantren Assalaam Surakarta. Based on the collected requirements, the system was designed using UML diagrams and implemented using the Laravel framework with a MySQL database. Functional validation was performed using Black Box Testing,

while User Acceptance Testing (UAT) was carried out to gauge user contentment and application usability.

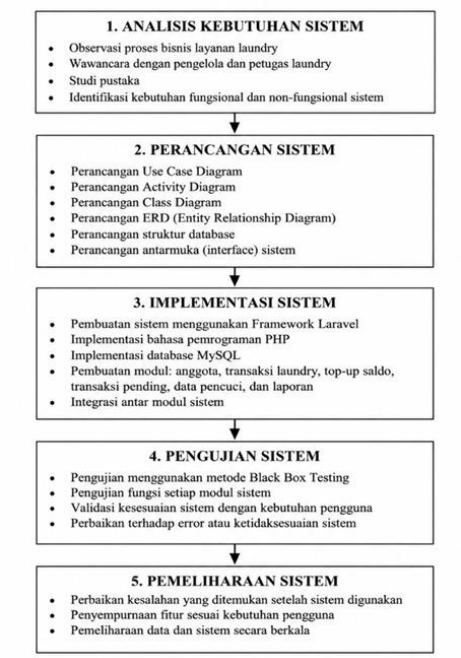

Figure 1. Waterfall Method

The research framework illustrates the systematic stages of the study, beginning with problem identification and ending with system development. The process starts by identifying operational issues within the Laundry Unit of Assalaam Islamic Boarding School, Surakarta, followed by data collection through observations, interviews, and a literature review. The collected data are then analyzed to determine the system requirements, which serve as the foundation for developing the proposed application using the Waterfall software development methodology. The overall research framework is presented in Figure 1, and each stage is described as follows.

1) **Problem Identification**: The problem identification stage examined the operational activities of the Laundry Unit through direct observation. The findings revealed fragmented member data management, manual laundry transaction processing, inadequate documentation of balance top-up and pending transactions, separate staff management, and inefficient report generation. These findings served as the basis for defining the system requirements.
2) **Data Collection**: Evidence was amassed via field observation, interviews, and literature survey. Observations examined the laundry workflow, interviews identified operational requirements with administrators, and literature review provided theoretical support for the proposed system development.

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3) **Requirements Analysis**: Requirements analysis identified the operational and supplementary specifications for the designed application. Operational specifications include authentication, member management, laundry transactions, balance top-up, pending transactions, staff management, and reporting. Non-functional requirements include security, usability, browser compatibility, response time, and database reliability.
4) **System Design**: The system design stage was executed based on the requirements identified during the previous phase. Its primary objective was to translate user requirements into a comprehensive system model that could guide the implementation process. The design employed the Unified Modeling Language (UML), including Use Case Diagrams to visualize engagement between participants and the application, Activity Diagrams to model business process workflows, and Class Diagrams to showcase the application's framework and interconnections among classes. In addition, an Entity Relationship Diagram (ERD) was developed to design the database structure and define the relationships among data entities. This stage also included user interface (UI) design to guarantee that the developed application meets user requirements and accurately supports the operational processes of the Laundry Unit at Assalaam Islamic Boarding School, Surakarta.

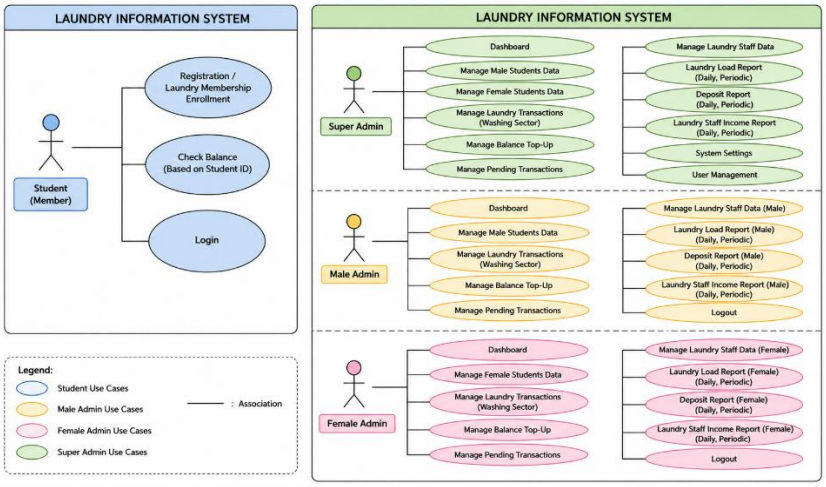

Figure 2. Use Case Diagram

The Use Case Diagram depicts how actors engage with the intended Online Laundry Information System. The system involves three primary actors: the Super Administrator, Male Unit Administrator, and Female Unit Administrator, each of whom is assigned role-based access permissions according to their respective responsibilities. These actors are authorized to manage student data, laundry transactions, balance top-up transactions, pending transactions, laundry staff data, and

operational reports. The use case diagram serves as the foundation for defining the application's operational requirements and making sure that the developed application adequately supports the operational processes of the Laundry Unit.

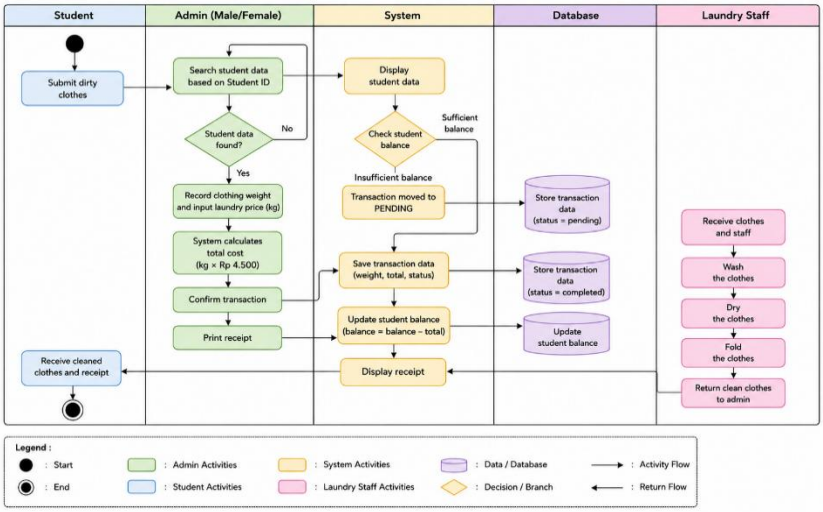

Figure 3. Laundry Transaction Activity Diagram

The Activity Diagram illustrates the workflow of the laundry transaction process, beginning with the retrieval of student information using the Student Identification Number (Student ID). The process continues with recording the laundry weight, automatically calculating the service fee, validating the available account balance, and storing the transaction data. If the member's balance is sufficient, the system automatically deducts the corresponding amount and updates the account balance. Otherwise, the transaction is recorded as a pending transaction, allowing it to be completed after the member performs a balance top-up. This workflow ensures accurate transaction processing while maintaining data consistency and operational continuity.

3. RESULTS AND DISCUSSION

3.1. Overview of the Research Object

Assalaam Islamic Boarding School, Surakarta, operates a Laundry Service Unit under the Islamic Boarding School Cooperative to provide laundry services for students. Based on the 2026 operational records, the unit serves 1,664 active members consisting of 817 male students and 847 female students. The large number of members requires an integrated information system to support member management, laundry transactions, balance top-up, pending transactions, and operational reporting more efficiently and accurately.

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3.2. Login Page

Figure 4 presents the Login page used for role-based authentication. The system validates user credentials and grants access according to administrator privileges, ensuring secure access to the application.

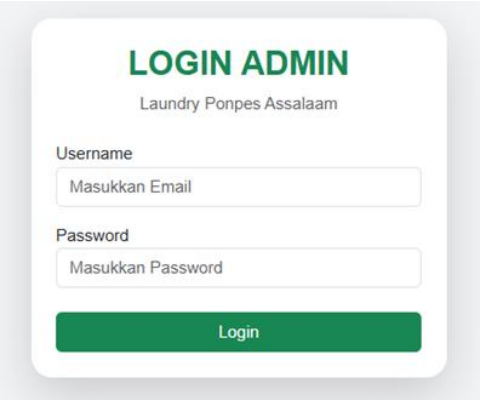

Figure 4. Login Page

3.3. Dashboard Page

The Dashboard provides real-time operational information, including the total number of registered members, member balances, completed transactions, pending transactions, and ongoing laundry activities. By presenting these indicators in a centralized interface, the dashboard enables administrators to monitor operations efficiently and supports faster decision-making.

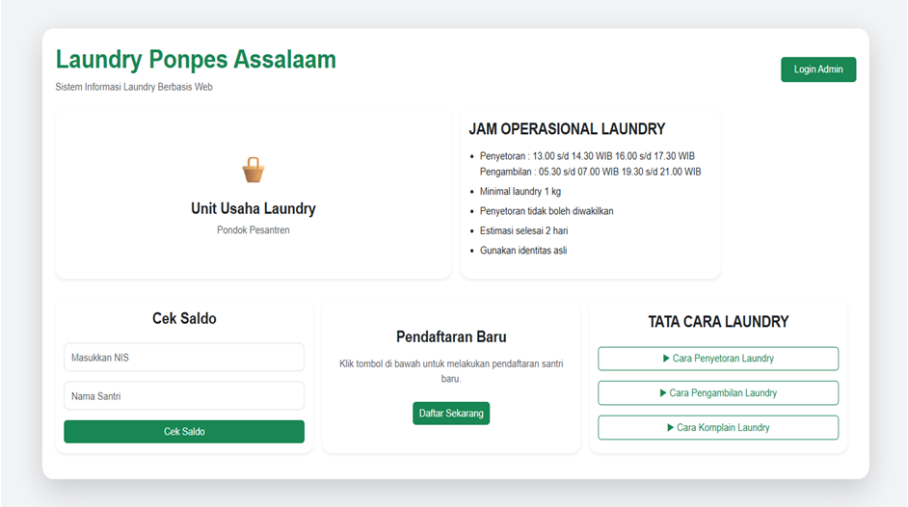

Figure 5. Dashboard Page

Jurnal Teknologi Informasi dan Pendidikan
Volume 20, No. 1, March 2027
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Figure 5 illustrates the implemented dashboard. The integration of operational summaries into a single interface enables administrators to monitor service performance more efficiently without navigating multiple system modules.

3.4. Student Member Management Page

The Student Member Management page enables administrators to add, edit, delete, search, and import student data from Microsoft Excel. It also displays complete member information, including student identity, dormitory, category, phone number, and account balance. These functions improve the efficiency, consistency, and accuracy of membership management.

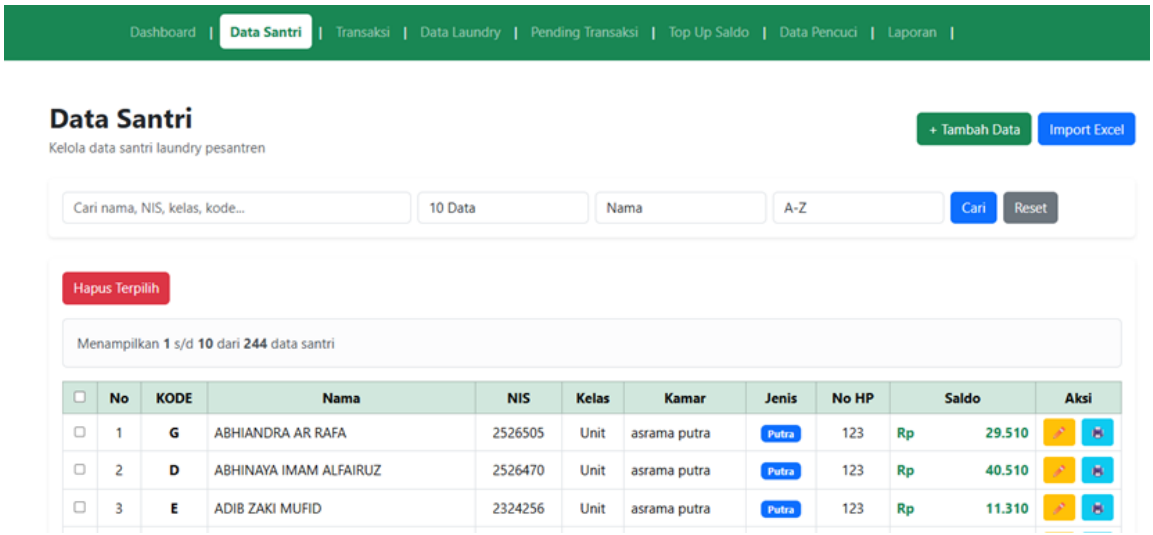

Figure 6. Student Member Management Page

Figure 6 demonstrates the implementation of the Student Member Management page. The developed functions successfully support complete member data management and enable administrators to retrieve and update information efficiently. The integration of member data with other modules also ensures that every laundry transaction is processed using valid and up-to-date information.

3.5. Balance Top-Up Page

The Balance Top-Up page allows administrators to recharge member balances by entering the Student Identification Number (Student ID). The system automatically retrieves member information, updates the account balance, and records the transaction history. This feature simplifies payment processing, supports pending transaction completion, and improves financial accuracy and transparency.

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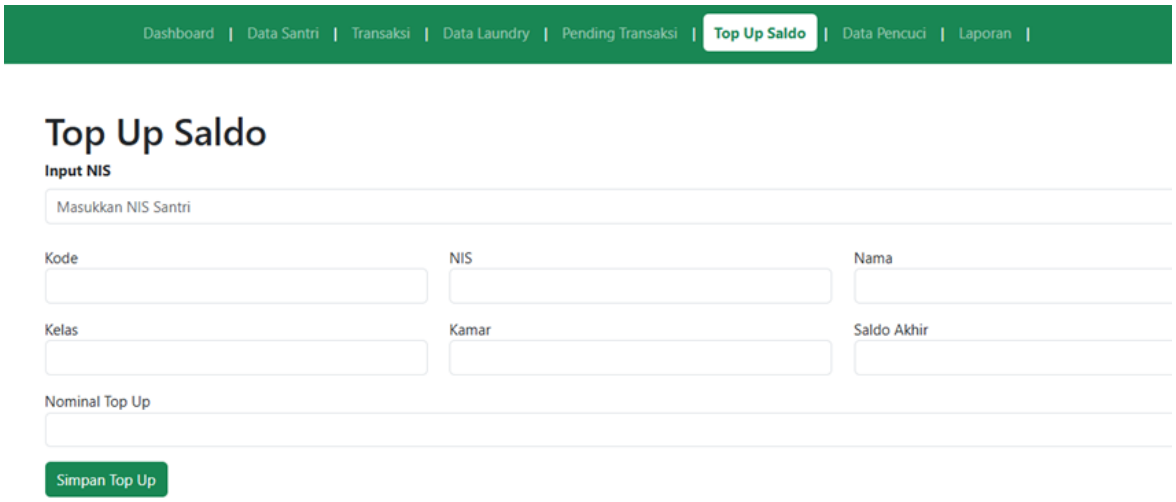

Figure 7. Balance Top-Up Page

Figure 7 shows the implementation of the Balance Top-up feature. The system successfully updates member balances automatically after each top-up transaction while maintaining complete transaction records. This implementation simplifies payment management and minimizes errors associated with manual balance updates.

3.6. Laundry Transaction Page

The Laundry Transaction page processes laundry requests by retrieving member information, calculating service fees automatically based on laundry weight, verifying account balances, and recording transaction data. If the balance is sufficient, the system completes the transaction and generates a receipt. Otherwise, the transaction is transferred to the Pending Transactions module, ensuring transaction continuity and data consistency.

Jurnal Teknologi Informasi dan Pendidikan
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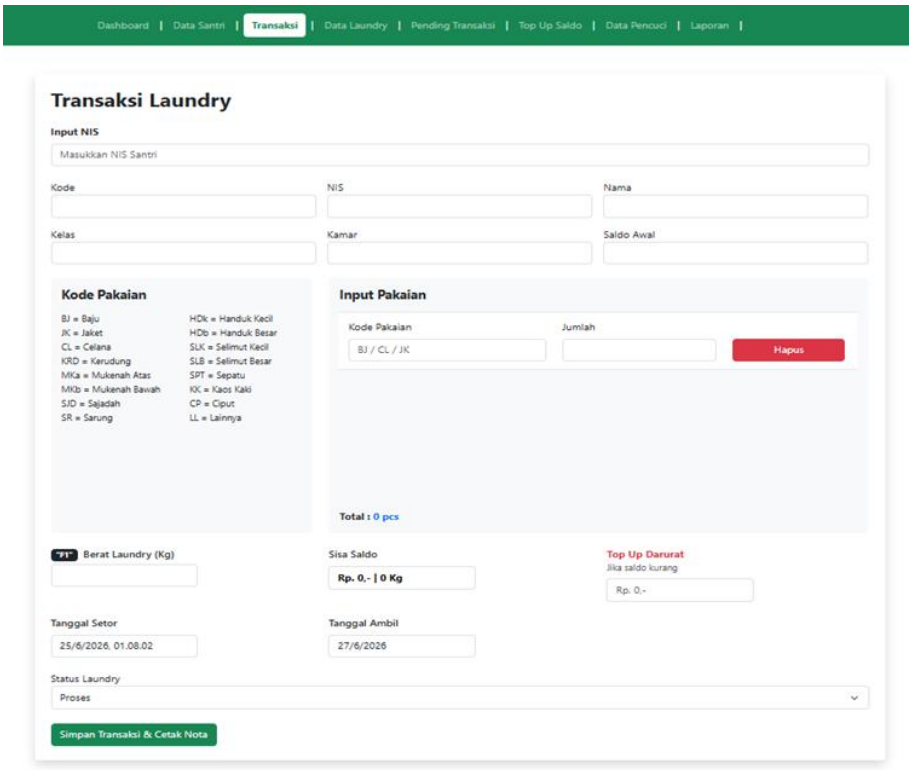

Figure 8. Laundry Transaction Page

Figure 8 presents the implementation of the Laundry Transaction page. The system successfully performs automatic fee calculation and balance deduction when sufficient funds are available. If the available balance is insufficient, the transaction is automatically redirected to the Pending Transaction module. This automation improves transaction efficiency while reducing calculation errors during operational activities.

3.7. Pending Transactions Page

The Pending Transactions page manages laundry transactions that cannot be completed due to insufficient member balances. The system automatically records pending transactions and updates their status after the required balance has been added through the Top-Up module. This mechanism prevents data loss and enables administrators to monitor outstanding transactions efficiently.

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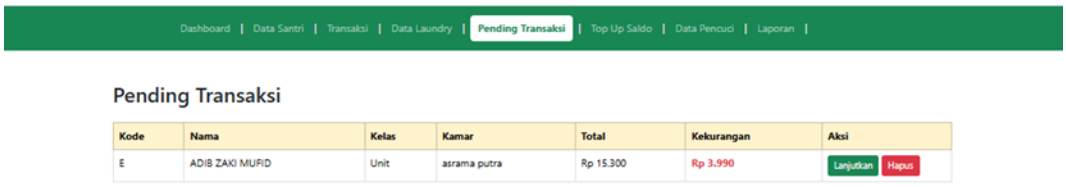

Figure 9. Pending Transactions Page

Figure 9 illustrates the implementation of the Pending Transaction page. The system successfully records transactions with insufficient balances and automatically updates their status once the required balance has been replenished. This implementation simplifies transaction monitoring and eliminates the need for administrators to re-enter transaction data manually.

3.8. Laundry Staff Management Page

The Laundry Staff Management page enables administrators to manage staff information, including adding, editing, deleting, and searching staff records. The module supports accurate assignment of laundry transactions and improves the administration of operational personnel.

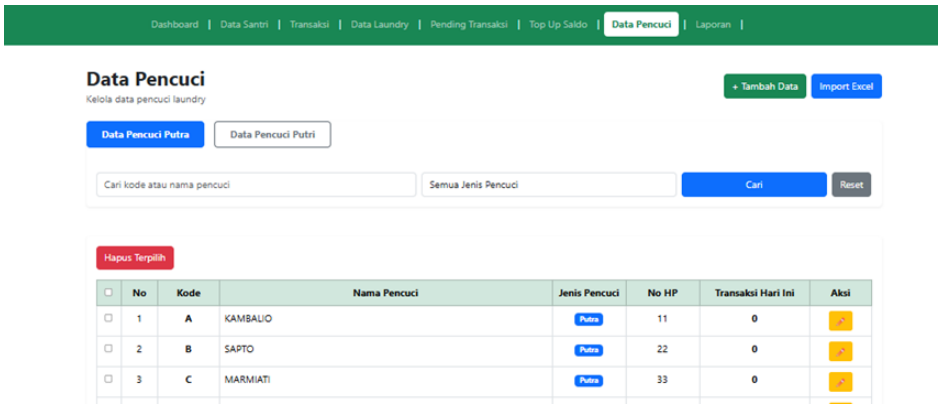

Figure 10. Laundry Staff Management Page

Figure 10 shows the implementation of the Laundry Staff Management page. The developed module successfully supports centralized staff data management and enables administrators to maintain accurate staff information for operational monitoring and reporting purposes.

3.9. Reports Page

The Reports page provides operational reports that can be filtered by date and student category. Administrators can export reports in PDF and Microsoft Excel formats to support documentation, monitoring, and operational evaluation.

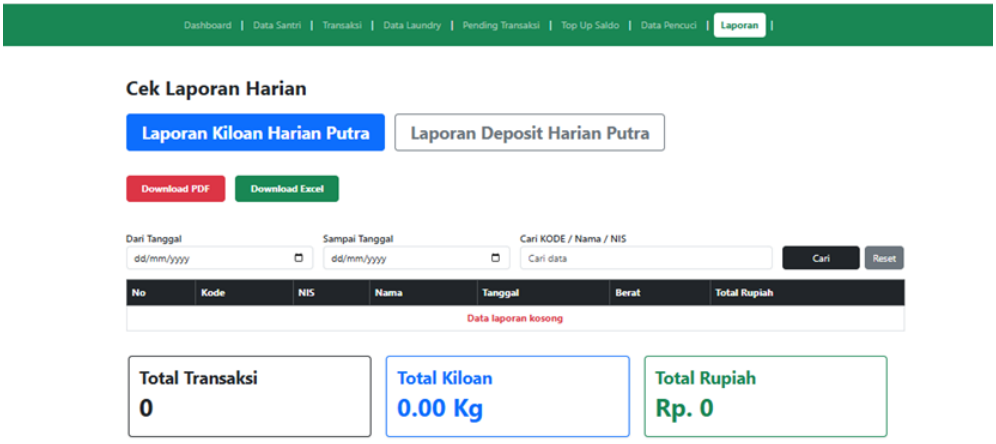

Figure 11. Reports Page

Figure 11 presents the implementation of the reporting module. The system successfully generates operational reports according to the selected criteria and exports them into PDF and Microsoft Excel formats. These reporting capabilities improve administrative efficiency and provide accurate documentation to support operational decision-making.

3.10. System Testing

System trial was run to make sure every functionalities of the proposed Web-Based Laundry Information System functioned in line with the predefined functional specifications. The evaluation employed the Black Box Testing method, which assesses system functionality by examining the relationship between entries and outputs without considering the internal program framework or source code implementation. This testing approach focuses on validating whether each feature performs as expected from the user's perspective. The testing covered all major system modules, including user authentication, student member management, balance top-up processing, laundry transaction processing, pending transaction management, laundry staff management, and report generation. Each module was evaluated using predefined test scenarios to ensure that the implemented functions produced the expected results under both valid and invalid input conditions.

3.11. Login Testing

Login testing was conducted to verify the authentication mechanism using valid and invalid username-password combinations.

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Table 1. Login Test Results

No	Test Scenario	Expected Result	Test Result	Status
1	Correct username and password	System displays dashboard	Matches	Successful
2	Correct username, incorrect password	System displays error message	Matches	Successful
3	Incorrect username, correct password	System displays error message	Matches	Successful
4	Username and password empty	System displays validation	Matches	Successful

All login scenarios produced the expected results, indicating that the authentication mechanism functioned correctly and prevented unauthorized access.

3.12. Student Member Management Testing

The Student Member Management module was tested to verify member data management functions, including add, edit, delete, search, and Microsoft Excel import.

Table 2. Student Member Management Testing Results

No.	Test Scenario	Expected Result	Actual Result	Status
1	Add a new student member record	The new student member record is successfully stored in the database.	As expected	Passed
2	Update an existing student member record	The student member information is successfully updated.	As expected	Passed
3	Delete a student member record	The student member record is successfully deleted from the database.	As expected	Passed
4	Search for a student member record	The system displays the corresponding member record based on the entered keyword.	As expected	Passed
5	Import student member data from a Microsoft Excel file	The member data are successfully imported into the system.	As expected	Passed
6	Import a file with an invalid format	The system displays an appropriate error message.	As expected	Passed

All student management functions operated successfully according to the specified requirements.

3.13. Balance Top-Up Testing

The Balance Top-Up module was tested to verify balance updates, transaction recording, and input validation.

Table 3. Balance Top-Up Testing Results

No.	Test Scenario	Expected Result	Actual Result	Status
1	Add balance to a member account	The member's account balance is increased according to the top-up amount.	As expected	Passed
2	Save a balance top-up transaction	The balance top-up transaction is successfully stored in the database.	As expected	Passed
3	Perform a balance top-up with complete data	The system successfully processes the balance top-up transaction.	As expected	Passed
4	Perform a balance top-up without selecting a member	The system displays a validation message.	As expected	Passed

5	Perform a balance top-up without entering the top-up amount	The system displays a validation message.	As expected	Passed
6	View the balance top-up transaction history	The system displays the stored balance top-up transaction history.	As expected	Passed

All balance top-up functions operated successfully and updated member balances accurately.

3.14. Laundry Transaction Testing

The Laundry Transaction module was tested to verify transaction processing, automatic fee calculation, balance deduction, pending transaction handling, and receipt generation.

Table 4. Laundry Transaction Testing Results

No.	Test Scenario	Expected Result	Actual Result	Status
1	Search for member data using identification information	The member data are successfully displayed.	As expected	Passed
2	Create a laundry transaction with complete data	The transaction data are successfully stored.	As expected	Passed
3	Calculate laundry service fees	The system calculates the service fee according to the entered data.	As expected	Passed
4	Process a transaction with sufficient member balance	The member balance is deducted and the transaction is successfully processed.	As expected	Passed
5	Process a transaction with insufficient member balance	The transaction is transferred to the pending transaction list.	As expected	Passed
6	Display transaction history	The transaction history is successfully displayed.	As expected	Passed

The laundry transaction module correctly calculated service fees, updated member balances, generated receipts, and processed pending transactions when required.

3.15. User Acceptance Testing (UAT)

User Acceptance Testing (UAT) was undertaken to appraise how users perceived the suggested system. The evaluation involved 25 respondents utilizing a five-level Likert scale covering interface design, ease of use, feature completeness, system performance, and overall user satisfaction.

$$P = \frac{\Sigma S}{S_{maks}} \times 100\% \quad (1)$$

Where:
P = Persentase tingkat penerimaan pengguna (%)
ΣS = Total skor yang diperoleh dari seluruh responden

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E.ISSN: 2620 – 6390
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S_maks = Skor maksimum (jumlah responden × jumlah pertanyaan × skor tertinggi)

The calculated percentage represents the overall level of user acceptance, where higher values indicate greater user satisfaction and system effectiveness.

Table 5. User Acceptance Testing (UAT) Results

No.	Evaluation Aspect	Mean Score
1	The system interface is visually appealing.	4.56
2	The system is easy to learn and use.	4.72
3	The system menus are easy to understand.	4.60
4	The information presented by the system is clear and understandable.	4.76
5	The data retrieval process is fast.	4.72
6	The laundry transaction process operates smoothly.	4.72
7	The balance top-up feature functions properly.	4.80
8	The system improves work efficiency.	4.68
9	The system facilitates laundry data management.	4.68
10	The system simplifies checking students' account balances.	4.72
11	The system facilitates laundry status monitoring by staff.	4.76
12	Overall, users are satisfied with the system.	4.72

Based on Equation (1), the total score obtained from the questionnaire responses was 1,411, while the maximum possible score was 1,500. Therefore, the overall user acceptance level of the proposed system was calculated using Equation (2).

$$P = \frac{1411}{1500} \times 100\% = 94{,}07\% \quad (2)$$

The proposed system achieved a user acceptance rate of 94.07%, categorized as Excellent. The highest score was obtained by the Balance Top-Up feature (4.80), indicating that the developed system effectively satisfied user requirements.

3.16. Discussion

The implementation and evaluation results demonstrate that the proposed Web-Based Laundry Information System with Balance Top-Up Payment and Membership Management successfully fulfills the operational requirements of the Laundry Service Unit at Assalaam Islamic Boarding School, Surakarta. The system integrates key operational processes, including member management, laundry transaction processing, balance top-up, pending transaction handling, staff management, and operational reporting into a centralized platform. Black Box Testing validated that every core functionalities functioned as per the specified requirements, while User Acceptance Testing (UAT) achieved a user acceptance rate of 94.07%, indicating an Excellent level of user satisfaction.

Compared with the previous manual process, the developed system improves data organization, reduces recording errors, accelerates information retrieval, and automates

report generation. The implementation of the Balance Top-Up and Pending Transaction features further enhances payment processing, transaction traceability, and operational efficiency.

These outcomes align with earlier investigations reporting that web-based information systems improve laundry service management. However, this study extends previous work by integrating balance-based payments, pending transaction handling, role-based access control, and membership management into a single system specifically designed for Islamic boarding school operations.

4. CONCLUSION

This study successfully developed a Web-Based Laundry Information System that integrates the entire operational management process of the Laundry Service Unit at Assalaam Islamic Boarding School, Surakarta, into a centralized platform. The proposed system effectively manages student member data, laundry transactions, balance top-up transactions, pending transactions, laundry staff information, and operational reports within a single integrated application, thereby simplifying data management and minimizing recording errors. The Balance Top-Up feature automates the payment process for laundry services, while the Pending Transaction feature accommodates situations in which members have insufficient account balances by ensuring that incomplete transactions are securely recorded and can be finalized after a balance recharge. In addition, the system implements role-based access control (RBAC) by assigning different access privileges to the Super Administrator, Male Unit Administrator, and Female Unit Administrator, thereby improving system security and operational management.

The evaluation results demonstrate that the developed system satisfies the specified functional requirements. Black Box Testing validated that every essential feature operated correctly, while User Acceptance Testing (UAT) accomplished a user acceptance rate of 94.07%, indicating an Excellent level of user satisfaction. These findings demonstrate that the proposed system is suitable for implementation in the Laundry Service Unit of Assalaam Islamic Boarding School, Surakarta, as it improves operational efficiency, transaction accuracy, service quality, and integrated data management.

Future system development may include the integration of automatic notification services through WhatsApp or SMS to inform members about laundry status, balance top-up confirmations, and laundry collection reminders. The system may also be enhanced by supporting digital payment methods, such as QRIS and online banking services, enabling members to perform balance top-ups electronically. Furthermore, developing dedicated Android and iOS applications, together with an analytical dashboard that provides visual transaction statistics and operational reports, would improve system accessibility and support managerial decision-making. For future research, software quality evaluation can be extended by adopting internationally recognized assessment standards such as ISO/IEC

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25010 or the System Usability Scale (SUS). These evaluation frameworks would enable a more comprehensive assessment of the system in terms of functionality, usability, reliability, maintainability, and user satisfaction.

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