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This article contributes to:

Web-based Mobile New Student Admission Information System at Darul Fikri Wattarbiyah Islamic Boarding School

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Abstract

Darul Fikri Wattarbiyah Islamic Boarding School faces operational inefficiencies in new student admissions due to a conventional, manual registration system that causes data redundancy, delayed document validation, and limited geographical accessibility. This study aims to develop a mobile web-based New Student Admissions (PSB) Information System to digitize the registration lifecycle. The system was developed using the Waterfall model, encompassing sequential stages of requirements analysis, system design, coding, and testing to implement core features, including online registration, document upload, payment validation, and announcement management. System functionality was evaluated using the black-box testing method across 20 specific test cases. The evaluation results demonstrate that all of the tested functional modules operated accurately according to the specified requirements, successfully executing role-based access control and input-output data validation without structural errors. The development of this digital platform implies that educational institutions can structurally transition from manual workflows to structured digital repositories, establishing localized data validity and broader accessibility for prospective student guardians.

Keywords: Information Systems, New Student Admissions, Mobile Web, Waterfall Method, Islamic Boarding Schools

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1. Introduction

The development of information technology in the digital era has brought significant transformations to the management of educational institutions, including Islamic boarding schools (pondok pesantren) [1], [2]. As an Islamic educational

institution with distinct characteristics, pondok pesantren is required to adapt to the need for administrative efficiency in order to improve the quality of service to the community [3]. Theoretically, an information system itself is a combination of information technology and the activities of people who use that technology to support operations and management [4]. In an institutional context, digitalization within the pondok pesantren environment represents an effort to transform conventional business processes into digital systems to increase institutional accountability and public service [5]. One crucial aspect that serves as the main gateway for interaction between prospective students (santri) and this educational institution is the New Student Admission (Penerimaan Santri Baru / PSB) process [6]. The application of technology in PSB is not merely about shifting paper forms into a digital format, but also building a positive image of the pesantren as a modern and professional educational institution, expanding promotional reach, and facilitating long-term archiving.

However, in reality, many pondok pesantren still rely on manual procedures [7], where prospective applicants must visit in person or submit physical documents, which is often time-consuming and prone to data errors [8]. Recent studies on educational digital transformation emphasize that manual and decentralized data tracking invariably restricts geographical accessibility and scales down institutional evaluation readiness [2]. A similar condition is currently faced by Pondok Pesantren Darul Fikri Wattarbiyah in managing its annual student admission cycle. The current ongoing process is still dominated by manual data entry using paper forms and decentralized digital archiving. This problem frequently leads to data accumulation at the committee level, high difficulty in rapidly validating administrative requirements, and delays in announcing selection results to prospective students. Therefore, a technological solution is required in the form of a web-based information system that functions as a centralized platform to enable real-time data exchange between prospective students and the Islamic boarding school, while simultaneously offering ease of system maintenance.

The development of this admission information system will be highly relevant and optimal if implemented on a mobile web basis. Conceptually, the mobile web is defined as the utilization of internet services accessed through portable devices, such as smartphones and tablets, to optimize data management and improve the quality of operational services digitally [9], [10]. A mobile web-based approach ensures that the user interface (UI) can automatically adapt to various device screen sizes through responsive web design techniques [11]. Given the high penetration of smartphone usage among the public today, where most student guardians tend to use mobile devices to search for information and perform digital transactions rather than desktop devices, the mobile web platform provides high accessibility flexibility [12]

Guardians can register anytime and anywhere without being constrained by geographical barriers, while the admission committee can monitor applicant statistics in real-time, validate payments, and manage the database securely.

In building this information system, this research applies the Waterfall method as the software development framework. The Waterfall method, or the linear sequential model, is a classic approach that emphasizes a systematic and sequential workflow [13]. The main characteristic of Waterfall is that each stage must be fully completed before proceeding to the next [14]. This sequential nature is highly suitable for system development with specific requirements that have been clearly defined from the beginning, such as a student admission administration system that possesses rigid, standardized rules. The use of Waterfall ensures that each stage ranging from requirement analysis, system design, coding, to testing is carried out in a measurable manner [15]. This minimizes the risk of logical errors in the admission system that demands high data accuracy, thereby producing a final product that is completely valid and aligned with the operational needs of the institution.

Numerous previous studies have extensively developed web-based school admission systems and generic enrollment portals [16]. However, a significant research gap remains as few studies have focused on the integration of mobile-responsive web accessibility tailored to the restrictive, multi-tier operational workflows of traditional Islamic boarding schools, particularly regarding secure digital document validation and real-time administrative finance monitoring for localized validation committees [1]. Most existing platforms provide general public registration without accommodating the structural verification dependencies required by boarding-school administrators, which creates a operational mismatch when applied in institutions like pesantren. This study directly addresses this gap by synthesizing a customized architectural workflow that balances mobile-end user convenience with centralized back-end management [4].

Based on the problems and theoretical foundations that have been described, the explicit objective of this research is to design and implement a mobile-responsive admission system uniquely tailored to the specific administrative workflow of Darul Fikri Wattarbiyah Islamic Boarding School, followed by evaluating its functional suitability. Through the presence of this system, it is expected that the digital transformation process within the pesantren can be sustainably realized, thereby providing a more validated, structurally integrated, and transparent registration platform for both the internal committee and prospective student guardians.

2. Methods

This study adopted an integrated methodological approach, combining observation techniques, in-depth interviews, and a literature review to ensure the validity of the collected data. In the software development phase, the Waterfall model was used as the primary guideline to ensure each stage of system development was carried out in a gradual and systematic manner, resulting in a robust and reliable application.

2.1 Data Collection Methods

a. Observation

Observation is defined as an assessment technique used to identify patterns, approaches, and methodologies employed within a system, while simultaneously mapping existing constraints to formulate appropriate solutive measures [17]. Direct field observations were conducted at Pondok Pesantren Darul Fikri Wattarbiyah from January 2026. The observation specifically focused on three primary aspects of the ongoing admission lifecycle: the physical distribution of registration forms, the physical document verification queue, and the manual logging of applicant identity data. The observation confirmed that the student registration procedure currently still relies on ledger recording and the accumulation of paper forms, which poses a significant risk of data loss or damage.

b. Interview

Interviewing is a fundamental data collection method in field studies aimed at ensuring the depth of information and the validity of research findings through direct question-and-answer sessions [18]. In-depth, semi-structured interviews were conducted on march 15, 2026, involving three key participants: the Head of the New Student Admission Committee, the Financial Officer, and one Administrative Staff member. The main interview themes and core questions were structured around five critical domains:

- Registration Workflow: Investigating the bottlenecks in manual form submission.
- Document Validation Problems: Assessing the time required to manually cross-check student identity archives.
- Payment Confirmation: Inquiring about the lack of standardized verification channels for banking receipt slips.
- Announcement Delays: Exploring the challenges of notifying prospective guardians residing outside the region.
- User Access Needs: Mapping the demand for multi-tier role permissions and mobile web layouts.

The interviews revealed that the primary constraints frequently encountered are the difficulty of rapidly verifying proof of payment and the slow process of delivering announcements to student guardians residing outside the region.

c. Literature review involves a series of systematic activities ranging from searching literary sources and thorough critical reading to the categorization and analysis of research materials to support the validity of scientific arguments [19]. This step focused on examining internationally indexed frameworks regarding mobile responsive design, SQL database encryption, and automated workflow validation in modern educational repositories.

2.2 System Development Method

This study employs the Waterfall model (as shown in **Figure 1**) due to its well-defined and sequential development process, which ensures that every stage in developing the web-based mobile New Student Admission Information System at Darul Fikri Wattarbiyah Islamic Boarding School is completed and properly documented before advancing to the next stage.

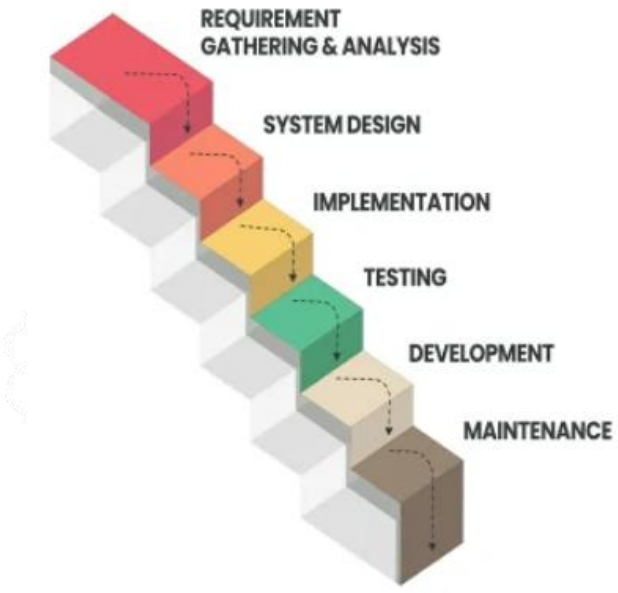

Figure 1. Waterfall Method

2.2.1 Requirement Gathering & Analysis

This initial phase focuses on gathering all system requirements in an in-depth manner through interactions with related stakeholders. The researcher identifies problems, defines system boundaries, and formulates functional and non-functional requirement specifications to ensure the application being built has a solid foundation.

The explicit output of this stage is a comprehensive Software Requirements Specification (SRS), which maps out critical system functions and non-functional constraints such as usability, accessibility, data integrity, and mobile responsiveness.

These parameters are crucial for international journal standards because the system directly handles sensitive personal applicant data and official admission documents. The specific functional and non-functional requirements established during this phase are detailed in **Tabel 1**.

Tabel 1. Specification of Functional and Non-Functional Requirements

Category	Requirement ID	Requirement Description / Scope
Functional Requirements	FR-01	**Online Registration:** Prospective student guardians can fill out demographic forms digitally
	FR-02	**Authenticated Login:** Secure role-based login access for prospective guardians, committee staff, and financial admins.
	FR-03	**Document Upload:** Secure digital file attachment for candidate birth certificates, identity cards, and academic transcripts.
	FR-04	**Payment Confirmation:** Digital upload mechanism for bank transfer slips with real-time transaction reporting.
	FR-05	**Admission & Test Management:** Back-end utilities for the committee to verify applicant documents and input test grades.
	FR-06	**Announcement Management:** Instant publishing engine to display selection results to specific logged-in users.
Non-Functional Requirements	NFR-01	**Mobile Responsiveness:** User interface automatically scales across mobile viewports using flexible CSS grids without content breakage.
	NFR-02	**Role-Based Access Control (RBAC):** Restricts administrative system menus from public access or unauthorized sub-users.
	NFR-03	**Data Validation:** Strict real-time front-end and back-end form syntax verification to block corrupted inputs or malicious scripts.
	NFR-04	**Database Backup:** Periodic structural automated scheduling for SQL database backups to minimize data loss risks.
	NFR-05	**Page Accessibility:** Optimization of page-load latencies to remain under 2 seconds under standard 4G mobile networks.

2.2.2 System Design

Once the requirements are clearly defined, the next step is to design the overall system architecture. In this phase, the researcher creates a blueprint that provides a technical overview of how the system will operate and interact prior to entering the coding stage. The concrete output produced in this phase consists of Unified Modeling Language (UML) diagrams (comprising Use Case Diagrams, Activity Diagrams, and Sequence Diagrams), a conceptual Entity-Relationship Diagram

(ERD), and a logical database schema layout mapping out relational tables in MySQL. the following are the results of the UML design:

a. Use Case

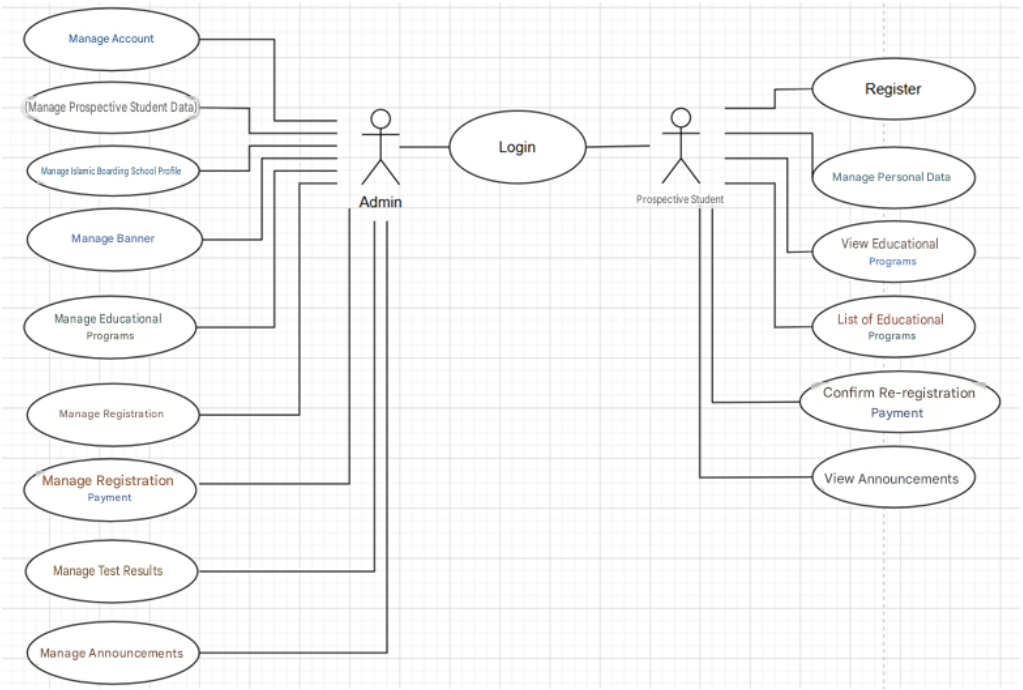

Figure 2. Use Case

This information system involves two primary actors, namely the Administrator (Admin) and Prospective Students (Calon Santri), each possessing specific access rights to support the operational process of new student admissions, as shown in **Figure 2**. Prospective Students have functional access to register, manage personal data, view and apply for educational programs, confirm re-registration payments, and independently monitor selection result announcements. On the other hand, the Admin holds full control over system management, which encompasses managing user accounts, student data, Islamic boarding school profiles, banner content, as well as technical validations such as payment management, test results, and the publication of announcements. All interactions between these actors are bridged by a login feature to ensure data security and service personalization in accordance with their respective roles within the platform.

b. View Program Activity

The view program activity flow (shown in **Figure 3**) begins when the Prospective Student (Calon Santri) actor performs the login process, which is validated by the System through data matching in the Database. Once access is granted and the user is redirected to the Dashboard page, the Prospective Student can select the 'view educational program' menu, which triggers the System to send a data request to the Database. Subsequently, the System

retrieves the information from the educational program table and displays it in a structured manner on the user's screen. This activity ends when the Prospective Student successfully views the list of available educational programs, allowing them to proceed to the program selection phase in the next stage of the registration process.

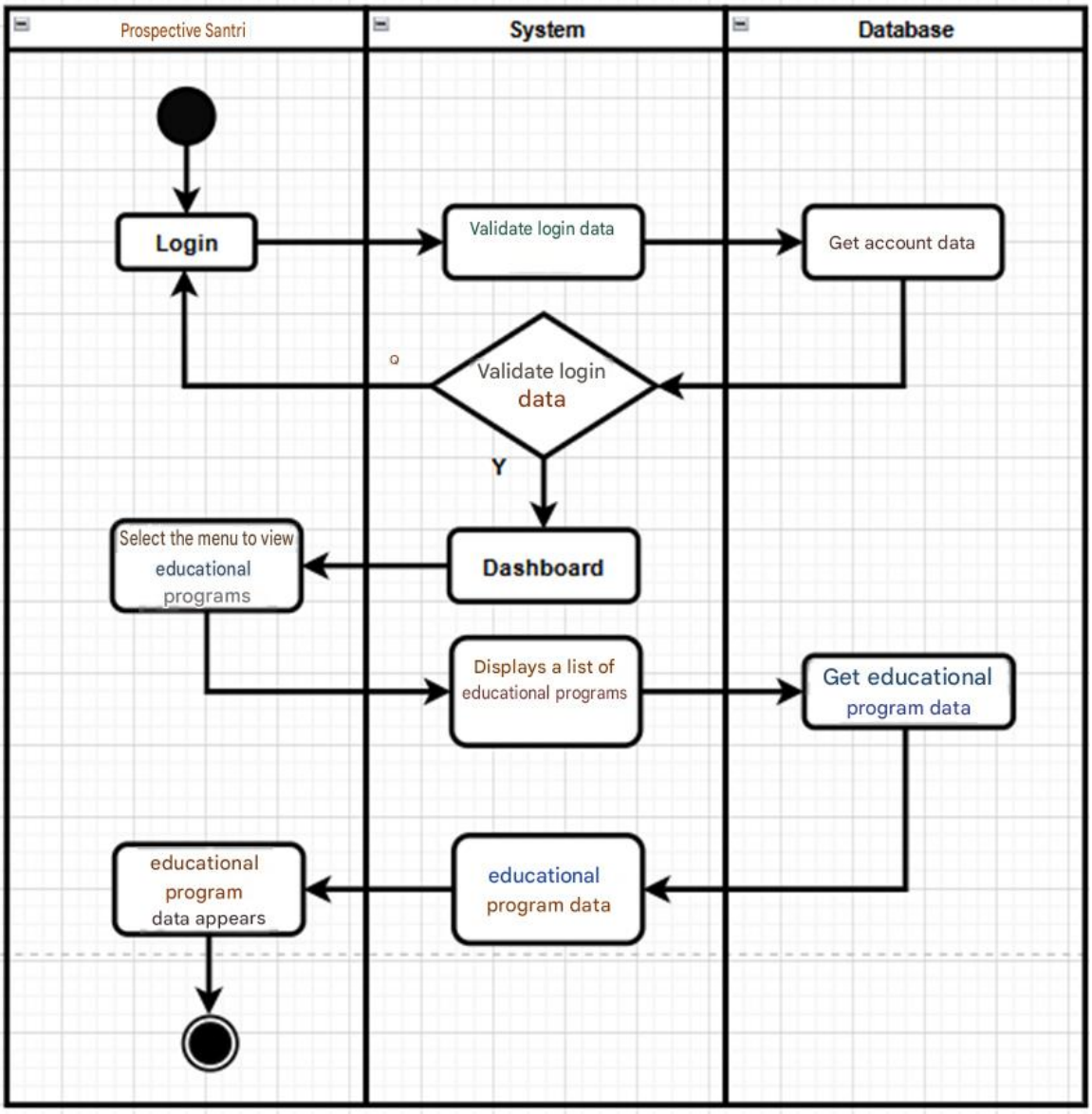

Figure 3. View Program Activity

c. Sequence Diagram for Managing Tests

The interaction flow begins when the Admin actor enters credentials in the form of a username and password into the System, which are then validated by checking the account data against the Database. Upon successful authentication, the System displays the dashboard page, allowing the Admin to select the manage test results data menu to trigger the retrieval of the latest test results from the Database. The Admin can then manage the test results—which include Al-Qur'an reading, writing, and skill tests—through add, edit, or delete instructions, where the System will process and store these changes

into the Database. This sequence of processes concludes with the transmission of a change confirmation from the Database to the System, which is then forwarded in the form of a notification to the Admin as a sign that the test results data update has been successfully completed (as shown in **Figure 4**).

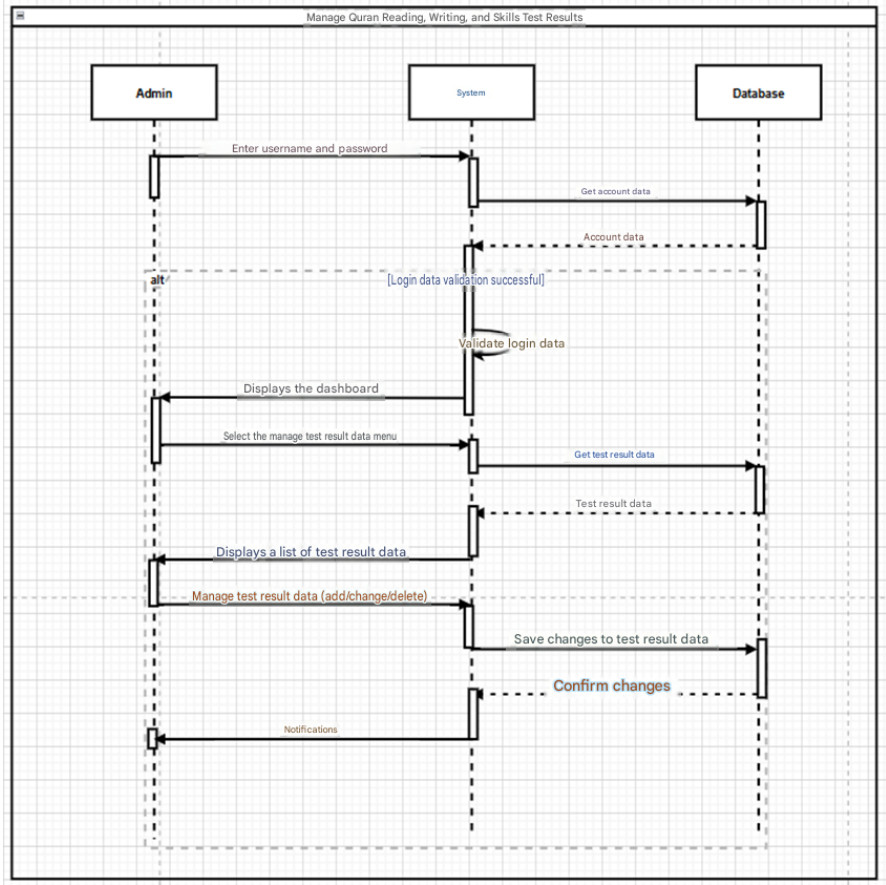

Figure 4. Sequence Diagram for Managing Tests

d. Database

The Entity Relationship Diagram (ERD) or relational database schema used to support the functionalities of the New Student Admission Information System (PPDB) at the Islamic boarding school. The database structure consists of 11 integrated tables, as shown in **Figure 5**, encompassing user management entities (admin, applicants), informational content (blog, page), and core admission entities such as admissions, admission_documents (berkas_penerimaan), test_schedules (jadwal_tes), and test_requirements (syarat_tes). Relations between tables are established using Primary Key and Foreign Key mechanisms, as shown in the junction table applicant_admissions (pelamar_penerimaan) that links applicant data with program pathways, as well as the test_scores (nilai_tes) and applicant_documents (berkas_pelamar) tables to record the graduation evaluation process.

2.2.3 Implementation

The implementation phase is the process of translating the design results into the designated programming language. Here, the system begins to be constructed in the form of program modules or small units that will later be integrated. The primary focus of this phase is the accuracy of code writing in accordance with the previously designed logic to ensure each feature functions properly.

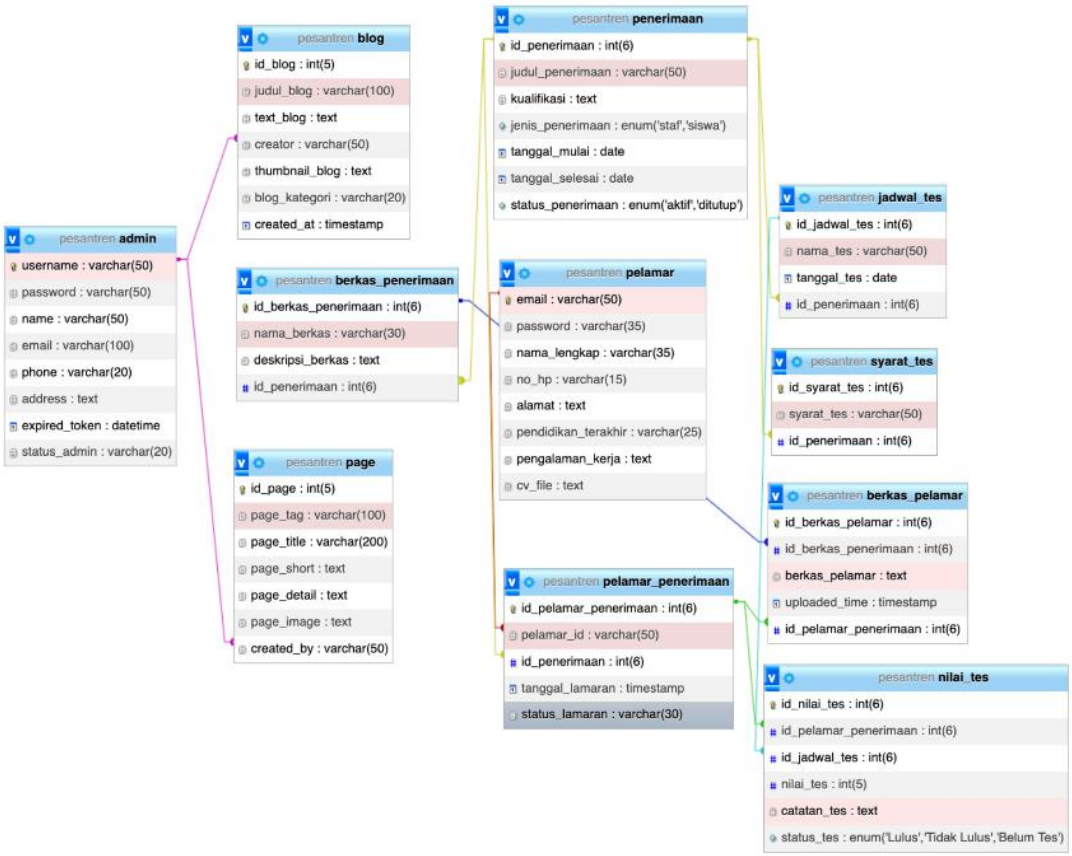

Figure 5. Database

The technical output of this phase is the production-ready source code deployed using PHP as the core programming language, Laravel as the MVC architecture framework, Bootstrap for responsive front-end components, and MySQL as the relational database engine, managed within a Linux-based Apache server environment.

2.2.4 Testing

After the coding process is completed, the system must undergo rigorous testing to guarantee its quality using black-box testing. Testing is conducted to detect bugs, logical errors, or discrepancies between the system outcomes and the initial requirements established.

The structural output of this stage is an explicit Test Execution Log concrete functional test cases. The testing scenario evaluates boundary inputs, cross-role file upload constraints, and form-validation triggers, using a predefined acceptance

criterion where 100% of functional blocks must return matching expected outputs with zero runtime syntax bugs.

2.2.5 Deployment

This stage is the phase where the thoroughly tested software is implemented into a real-world environment or released to the public. The system is installed on a production server so that users can access it through their devices. The explicit output of this phase is the launch of the live system URL hosted on an active cloud server infrastructure, accompanied by a User Training Manual Document tailored for the admission operators and system administrators at the boarding school.

2.2.6 Maintenance

The final stage in the Waterfall cycle is maintenance, which aims to preserve system performance to ensure it continues to run smoothly over the long term. Maintenance includes correcting errors discovered after actual usage, enhancing features in response to evolving needs, and adapting the system to changes in the technological environment. The specific output generated in this phase is a routine system optimization protocol, comprising server security patch updates, daily data monitoring log evaluations, and database optimization queries to ensure long-term platform sustainability.

3.Results and Discussion

3.1 Implementation

a. Dashboard interface

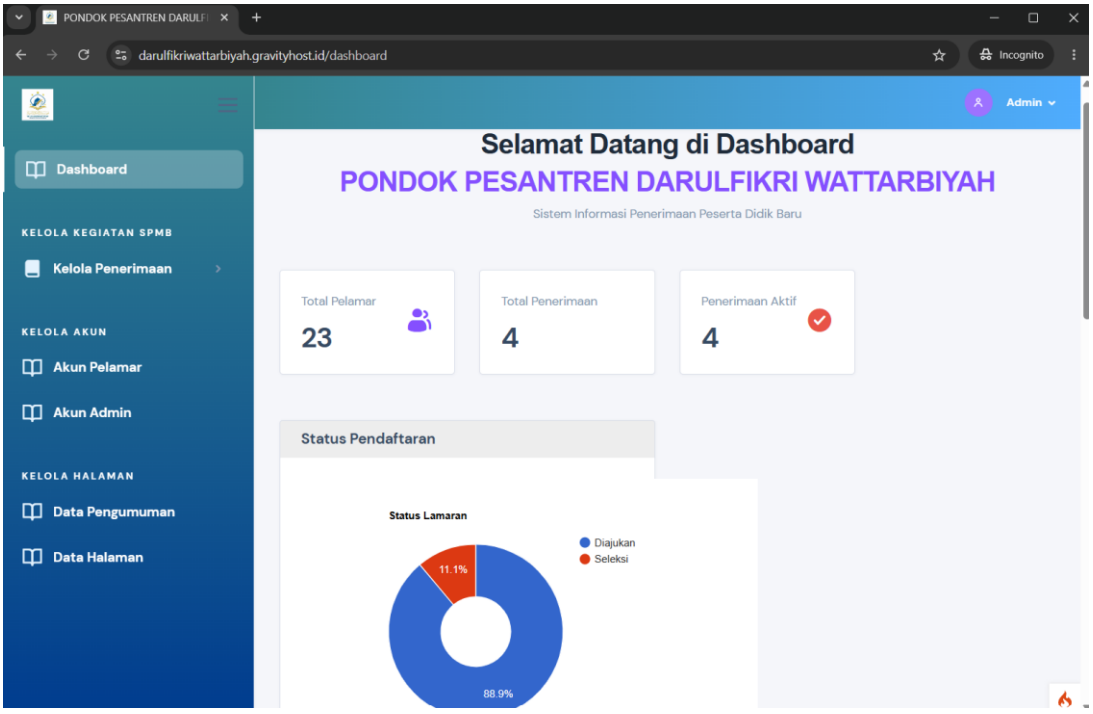

Figure 6. Dashboard

The main dashboard interface of the web-based New Student Admission Information System at Pondok Pesantren Darulfikri Wattarbiyah **Figure 6.**

fundamentally transforms the administrative workflow from manual tracking into an analytical data monitoring hub. Rather than merely presenting visual metrics, this interface structurally resolves the traditional inefficiencies of paper-based student tracking. By consolidating real-time metrics—such as total applicants (23 records), total accepted students (4 records), and active admission quotas—the dashboard completely eliminates the need for administrators to perform manual, error-prone data counting across loose physical forms.

Furthermore, the integration of a dynamic registration status pie chart (showing 88.9% submitted and 11.1% in the selection phase) provides institutional leaders with immediate, clear visibility into the enrollment pipeline. This real-time visualization directly accelerates executive decision-making, allowing the pesantren management to instantly assess current marketing outreach, monitor validation bottlenecks, and strategically adjust active admission quotas without waiting for delayed end-of-month manual report.

b. Admission List

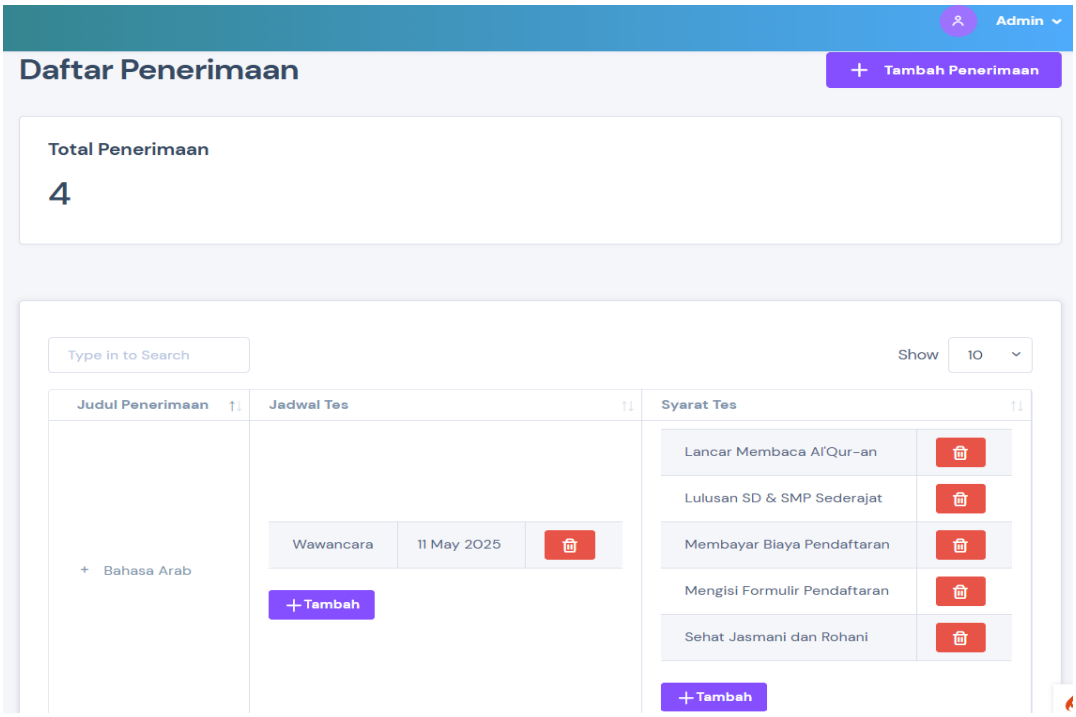

Figure 7. Admission List page

The 'Admission List' interface page (as shown in **Figure 7**)serves to manage administrative parameters and selection requirements for prospective new students. At the top of the page, there is an information card displaying the active admission tracks or total quotas, which currently amount to four, along with an acceleration button to add new admission data. At the bottom, the system provides an integrated data management table containing information

regarding admission titles (such as 'Arabic Language'), the scheduling of test types (such as interviews), and a detailed list of component graduation requirements.

c. Registration Detail

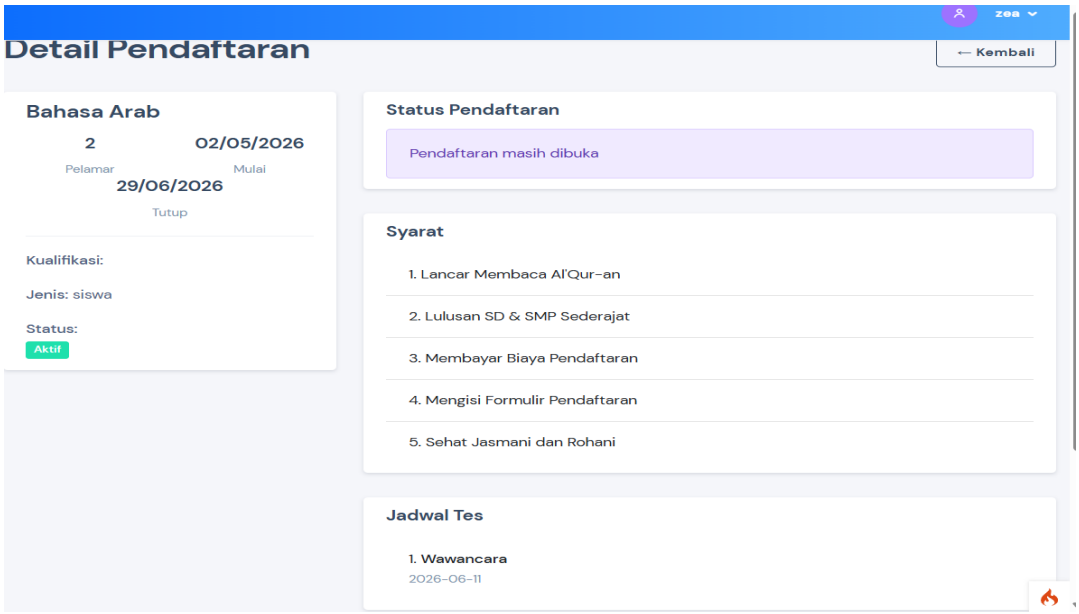

Figure 8. Registration Detail

The 'Registration Detail' interface page serves to provide comprehensive information regarding specific programs or selection tracks, such as the 'Arabic Language' program, to the users.

Tabel 1. Comprehensive Black-Box Testing Protocols and Results

Module/ Feature	Test Case ID	Test Scenario	Expected System Result	Status
Login	TC-01	Input valid username and password credentials	System successfully authenticates user and redirects to the dashboard.	Valid
	TC-02	Input invalid username/password combination	System denies access and displays a "Wrong Credentials" error message.	Valid
	TC-03	Submit the authentication form with empty fields	System triggers front-end validation forcing mandatory text entry.	Valid
	TC-04	User triggers the logout button action	System destroys the active session and destroys secure tokens, redirecting to login.	Valid
Registration	TC-05	Submit a complete student registration form.	System saves data to the MySQL database and generates a unique applicant ID.	Valid

	TC-06	Submit form with missing mandatory demographic data.	System rejects submission and flags the empty input fields.	Valid
	TC-07	Submit registration using an already registered identity card number.	System prevents duplicate registration via database constraint checks.	Valid
Document Upload	TC-08	Upload document in valid PDF/JPEG format within the size limit.	System uploads file to secure server repository and updates attachment link.	Valid
	TC-09	Upload document with an invalid file extension (e.g., .exe, .mp3).	System blocks the upload process and displays an "Invalid Format" warning.	Valid
	TC-10	Upload a valid document type that exceeds the size limit (>2MB).	System interrupts upload, enforcing file-size gateway validation.	Valid
Payment Confirmation	TC-11	Submit payment confirmation form with valid image proof.	System records transaction data and changes status to "Pending Verification".	Valid
	TC-12	Submit payment confirmation form without attaching proof.	System restricts submission, demanding a physical file payload.	Valid
Admin Validation	TC-13	Administrator approves fully compliant applicant data.	System toggles status to "Verified" and opens subsequent test phase portals.	Valid
	TC-14	Administrator rejects applicant data with fraudulent data.	System terminates application status and logs rejection reasoning.	Valid
	TC-15	Administrator marks data as "Revise" due to unreadable file uploads.	System re-opens file field for the user and sends a revision notification.	Valid
Announcements	TC-16	Administrator publishes official final selection results.	System broadcasts results instantly to the public dashboard page.	Valid
	TC-17	Applicant logs in to view personal admission results.	System dynamically filters and renders specific selection passes/fails.	Valid
Role-Based Access	TC-18	Applicant attempts to directly access admin URL endpoints.	System blocks request via middleware and forces an HTTP 403 Forbidden page.	Valid
	TC-19	Administrator attempts to view applicant-specific entry views.	System redirects administrator to the centralized back-end console seamlessly.	Valid
Mobile Responsiveness	TC-20	Render application pages across various viewports (Mobile, Tablet, Desktop).	Elements automatically rearrange using flexible responsive design grids.	Valid

3.3 Testing

Black box testing result (shown in **Tabel 1** and **Tabel 2**) focuses on testing the functionality of each feature within the system to ensure its performance aligns with the specified requirements, without conducting an examination of the program's code structure [20].

Tabel 2. Structural Comparison Between Legacy System and Proposed Web-Mobile System

Aspect / Dimension	Legacy Manual System	Proposed Web-Mobile System
Registration Method	Physical attendance required; guardians must pick up and fill out paper forms on-site.	Fully online; accessible remotely via any mobile smartphone browser.
Data Storage	Vulnerable paper binders and isolated local spreadsheets; highly prone to data redundancy.	.Centralized MySQL database server; enforces relational constraints to completely prevent redundancy.
Document Validation	Manual, visual inspection of physical paperwork; slow response times due to physical pile-ups.	Digital document uploads with structural gateway validation (size, type) and real-time status tracking
Announcement Delivery	Static paper announcements pinned to on-site bulletin boards or via sporadic manual texts.	Instant public broadcasting module; dynamic filtering for role-based personal pass/fail results.
Reporting & Monitoring	End-of-month manual tallying across registration books, leading to delayed decision-making.	Real-time administrative dashboard visualization with live applicant metrics and interactive status pie charts.
Accessibility	Limited by geographical proximity and strict pesantren office operational hours.	24/7 ubiquitous accessibility, removing spatial constraints for prospective student guardians.

4. Conclusion

Based on the results of the design, development, and testing conducted, this study has successfully implemented a mobile web-based New Student Admission Information System at Pondok Pesantren Darul Fikri Wattarbiyah using the Waterfall model. The developed platform structurally supports core workflows, including online user registration, digital document management, back-end admission monitoring, payment verification, and real-time announcement publication. This digital architecture transitions the institution's registration cycle from manual mechanisms into a centralized digital repository.

The system evaluation results utilizing the Black-Box testing method demonstrate that the tested functional modules ranging from data visualization on the dashboard page and management of registration parameters to input-output verification operate according to the specified requirements. The system successfully

executed role-based access control and validated data entry streams under the predefined test cases without structural bugs. This indicates that the system is technically sound and functionally suitable for its primary users.

However, this study notes several limitations that should be addressed in subsequent research. The current evaluation is restricted to a limited testing scope within a single educational institution and lacks formal load performance testing, rigorous automated security vulnerability scans, and long-term user experience metrics. Therefore, future studies should expand upon these findings by incorporating standardized usability testing (such as the System Usability Scale), executing detailed performance and security evaluations, and implementing the platform across multiple pesantren networks to validate its scalability and cross-institutional adaptability.

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Authors' Declaration

Authors' contributions and responsibilities - The authors made substantial contributions to the conception and design of the study. The authors took responsibility for data analysis, interpretation, and discussion of results. The authors read and approved the final manuscript.

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Additional information - No additional information from the authors.

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