WEB-BASED SANTRI MANAGEMENT AND MONITORING SYSTEM INTEGRATED WITH WHATSAPP

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Abstract

The increasing number of students in Islamic boarding schools (pesantren) has made administrative tasks such as recording student violations, achievements, permissions, and health records more complex. Many schools still manage these data manually, resulting in duplication, delayed communication, and inefficient supervision. This study addresses this issue by developing a Web-Based Santri Management and Monitoring System integrated with WhatsApp, aiming to streamline data management and enhance real-time communication between administrators, guardians, and health staff. The system was developed using the Waterfall methodology, which includes requirement analysis, system design, implementation, testing, and maintenance stages. Three main user roles were defined: administrators, guardians, and health staff, each with specific responsibilities. A User Acceptance Test (UAT) was conducted with 32 respondents, including one administrator, 30 guardians, and one health staff. The results showed satisfaction levels of 100% for administrators, 87% for guardians, and 100% for health staff, indicating high user acceptance. These findings suggest that the system effectively addresses the challenges of manual data management, improves administrative efficiency, and strengthens communication through real-time WhatsApp notifications, providing a comprehensive solution for student monitoring and supervision in Islamic boarding schools.

Keywords- *Web-based System, Santri Management, Monitoring System, WhatsApp Integration*

1. INTRODUCTION

Islamic boarding schools (pesantren) play a vital role in nurturing students' morals, discipline, and religious knowledge [1][2][3]. However, as student populations grow, administrative tasks such as recording violations, achievements, permissions, and health information become increasingly complex. Observations at the Bahrul Ulum Sungailiat Islamic Boarding School indicate that more than 70% of such data is still managed manually, causing delays, duplication, and poor communication with guardians. These challenges highlight the need for an integrated digital system that manages student data efficiently while supporting real-time communication.

Previous studies have applied the Laravel framework in Islamic boarding schools for different purposes. For example, a web-based registration system at Bahrul Maghfiroh [4] focused on simplifying student admissions, improving data entry efficiency but covering only new student records. Another study developed a web-based institutional profile management system [5] centralizing school data for public access but without support for student-specific monitoring or guardian communication. Similarly, a student memorization tracking system at Salafiyyah Al Hidayah [6] enhanced academic data management but remained limited to learning progress and internal reporting. In terms of communication, Hidayatullah [7] integrated WhatsApp notifications for attendance, increasing parental engagement, while Nur Khafidhoh and Lailatul Badriyah [8] used WhatsApp for school payments to improve timeliness. Although effective in their specific domains, these studies were limited to single administrative functions and did not offer a comprehensive platform that integrates management, monitoring, and real-time communication across multiple aspects of student life.

To address these gaps, this study develops a Web-Based Santri Management and Monitoring System Integrated with WhatsApp, designed to simultaneously manage student violations,

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achievements, permissions, and health records while enabling real-time communication with guardians and staff. The system aims to enhance administrative efficiency, ensure timely delivery of information, and strengthen supervision and parental involvement in pesantren activities.

The development follows the Waterfall model, chosen for its structured and sequential process, which is suitable for projects with clearly defined requirements. The Laravel framework ensures a secure, modular, and maintainable back-end, while WhatsApp integration leverages a communication tool familiar to most guardians, allowing the system to function both as a data management tool and a practical communication medium. Together, these approaches provide a robust solution for improving transparency, responsiveness, and overall student monitoring in Islamic boarding schools.

2. METHODOLOGY

This study employed a Research and Development (R&D) approach using the Waterfall model as the software development framework. The R&D approach was selected because it allows both the creation of a software product and the systematic evaluation of its effectiveness in a real environment through user feedback. The Waterfall model was chosen for its structured and sequential nature, which ensures clarity in each development phase and minimizes ambiguity during implementation [9][10].

The research was conducted in a structured process starting with data collection through interviews and field observations, followed by analysis to identify user needs and system requirements. The system was then designed and implemented, and finally tested and evaluated using User Acceptance Testing (UAT) with target users. Corrective and adaptive maintenance was carried out to finalize the system. This process is illustrated in Figure 1.

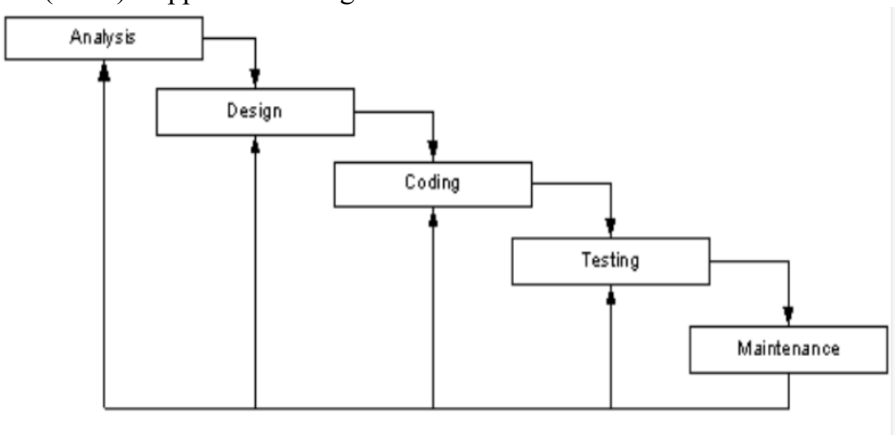

Figure 1. Metode Waterfall

2.1 Requirement Analysis

This stage aimed to identify user needs and functional requirements through direct interviews and field observations involving caregivers, guardians, and health staff. Both qualitative and quantitative data were collected to understand how data was managed manually and what challenges occurred in monitoring and communication. The analysis revealed duplication in records, delayed information delivery, and lack of integration between departments. Based on these findings, system requirements were formulated to include modules for violations, achievements, permissions, and health data management, as well as automated communication through WhatsApp notifications.

2.2 System Design

The system was designed based on the functional requirements identified in the previous stage. The design process included

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creating system architecture diagrams, database schemas, and user interface mockups. Each user role—admin, guardian, and health staff—was provided with a dedicated dashboard to ensure effective interaction with relevant data. The design also ensured that the relationship between tables and data entities was well-defined to support reliable information retrieval.

1. Use Case Diagram

The Use Case Diagram illustrates the interactions between users (actors) and the system, identifying functional requirements and defining each actor's access rights. Three actors were defined: Admin/Caregivers, Student Guardians, and Health Officials. The diagram clarifies the responsibilities and interactions of each role within the system, supporting role-based access control, as shown in Figure 2.

Figure 2. Use Case Diagram

2. Class Diagram

The Class Diagram represents the structural design of the system, including main entities, their attributes, and relationships between them. The central entities include User, Santri, Achievement, Permit, MedicalRecord, Violation, and Referral. Each class defines essential operations (create, update, delete, find) that support the system's core CRUD functionality. The diagram ensures that data relationships and dependencies are clearly modeled, supporting reliable system implementation, as shown in Figure 3.

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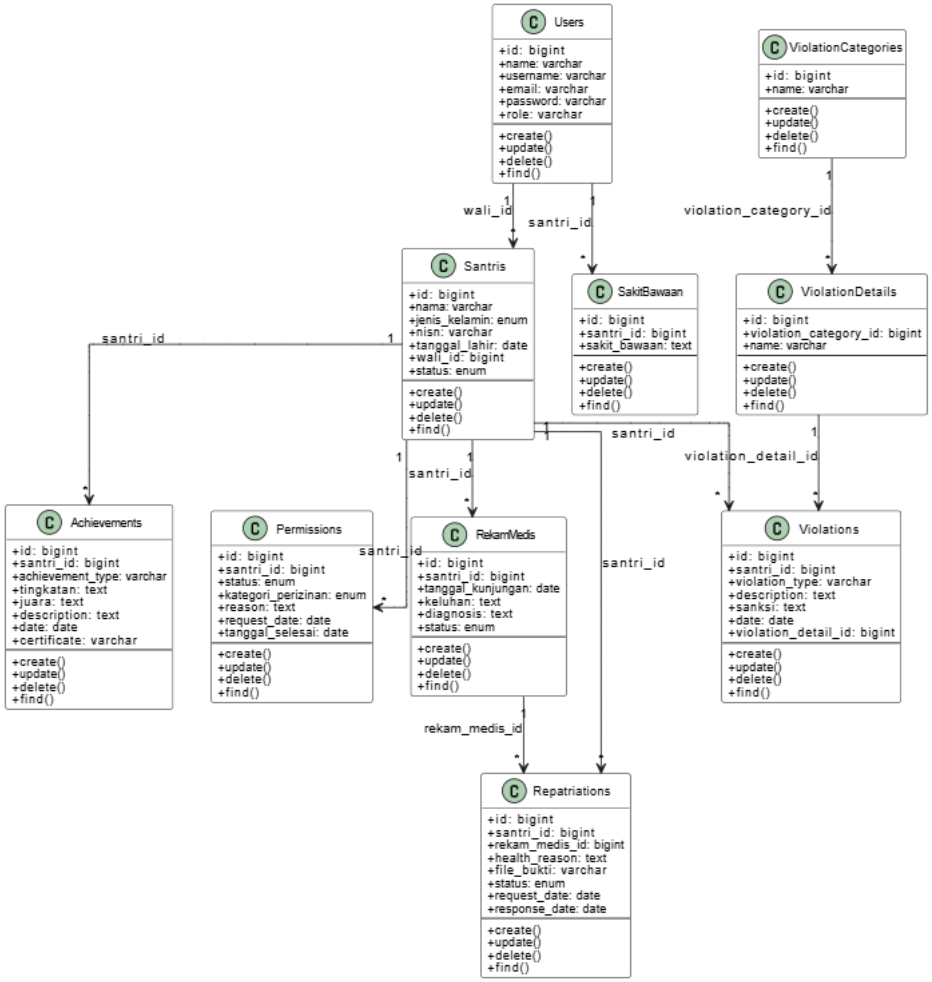

Figure 3. Class Diagram

2.3 Implementation

The implementation stage involved translating the design into functional code. The system was developed using the Laravel framework for backend development and Tailwind CSS for front-end design to ensure a responsive and user-friendly interface. WhatsApp API integration was implemented to automate real-time notifications regarding student activities and updates. Dashboards for each user role (Admin, Guardian, Health Staff) were designed as shown in Figures 4–6.

2.4 Testing and Evaluation

System testing was conducted using the User Acceptance Testing (UAT) method to evaluate the degree of acceptance of the system by its intended users. UAT was selected as the research method because it allows direct assessment of user satisfaction, usability, and system functionality, which is consistent with the study objective of evaluating the system's effectiveness in managing student data, violations, health records, and communication with guardians [19][20]. The testing involved three categories of users: Admin (Caregivers), Student Guardians, and Health Staff. Respondents were selected based on their roles and experience using the system:

1. Admin: 1 main admin responsible for overall system management.
2. Student Guardians: 30 respondents selected purposively to represent active guardians monitoring students.
3. Health Staff: 1 staff member responsible for student health records and referrals.

Each respondent completed a structured questionnaire using a Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). The scoring weights are shown in Table 1. The questionnaire assessed aspects of ease of use,

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feature completeness, convenience, and suitability of the system.

Tabel 1. Likert Scale Weights

Likert Scale	Score
Strongly Disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly Agree	5

After collecting the data, the results were analyzed using the following formulas:

Average Score per Question:

$$Average\ Score = \frac{Total\ Score\ of\ Response}{Number\ of\ Respondents} \quad (1)$$

Percentage of Satisfaction:

$$Percentage\ (\%) = \frac{Average\ Score}{Maximum\ Score} \quad (2)$$

The percentage value was then interpreted using a five-level quality category Table 2, allowing an assessment of whether an aspect is satisfactory or requires improvement.

Tabel 2. Likert Scale Weights

Percentage Score (%)	Criteria
20.00% – 36.00%	Poor
36.01% – 52.00%	Fairly Poor
52.01% – 68.00%	Sufficient
68.01% – 84.00%	Good
84.01% – 100.00%	Excellent

2.5 Maintenance

The final stage involved corrective and adaptive maintenance. Corrective actions were taken to fix minor bugs found during the testing phase, while adaptive maintenance was carried out to improve features and accommodate additional requirements from users within the boarding school environment.

3. RESULTS AND DISCUSSION

3.1 Requirement Analysis

At the requirement analysis stage, data were collected through direct interviews and observations with caregivers, student guardians, and health officials at Bahrul Ulum Islamic Boarding School. The results showed that data management related to student activities, permissions, and health records was still performed manually, leading to difficulties in monitoring, data duplication, and delays in communication with guardians.

Based on the analysis, the web-based Santri Management and Monitoring System was developed to support three main user roles: Admin/Caregivers, Student Guardians, and Health Officials, each with specific functions and responsibilities.

1. Admin/Caregivers act as the system's primary administrators. They can log in, manage student and guardian data, record violations and achievements, review permission requests, access health data, and process home referrals submitted by health officials.
2. Student Guardians are responsible for monitoring their children's activities while in the boarding school. They can view student profiles, track achievements and violations, submit permission requests, and monitor health records in real time.
3. Health Officials are responsible for recording medical data such as diagnoses, treatments, and congenital illness history. They can also recommend home referrals if a student is experiencing serious illness.

This division of user roles was defined to ensure that data management processes become more structured, inter-role communication improves, and decision-making can be performed more efficiently. The output of this stage was a set of functional and non-functional requirements that guided the system design process.

3.2 System Implementation

The system was developed as a web-based application using the Laravel framework and MySQL database. It can be accessed by three types of users: Admin/Caregivers, Student Guardians, and Health Officials. Each user is

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directed to a personalized dashboard according to their respective access rights and roles.

3.2.1 Admin Dashboard

The Admin Dashboard serves as the main control center for managing student-related data, including parents' information, violations, achievements, permissions, and referrals submitted by health officials. The interface is designed to be simple yet informative, ensuring that administrators can easily navigate and manage all available features. The implementation of the Admin Dashboard is illustrated in Figure 4.

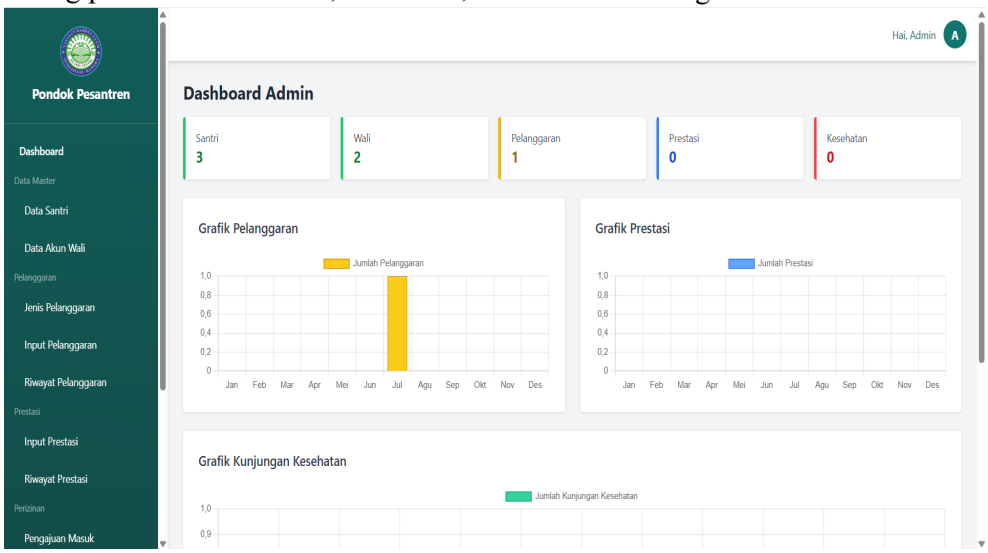

Figure 4. Admin Dashboard

3.2.2 Guardian Dashboard

The Guardian Dashboard provides access to information related to personal data, student profiles, violation records, achievements, and health reports. In addition, guardians can directly submit home leave requests through the system, which is automatically integrated with the admin panel for approval and monitoring. The implementation of the Guardian Dashboard is shown in Figure 5.

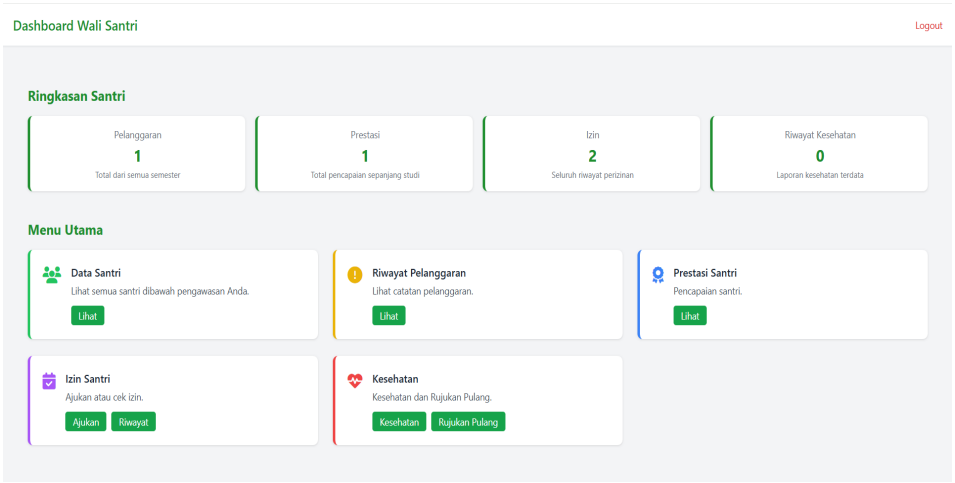

Figure 5. Guardian Dashboard

3.2.3 Healthcare Provider Dashboard

The Healthcare Provider Dashboard includes features for recording medical records, documenting congenital disease histories, and inputting diagnoses for each student. Health officials can also submit discharge recommendations for students with serious

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health conditions, which are then reviewed and approved by the admin. The implementation of this dashboard is shown in Figure 6.

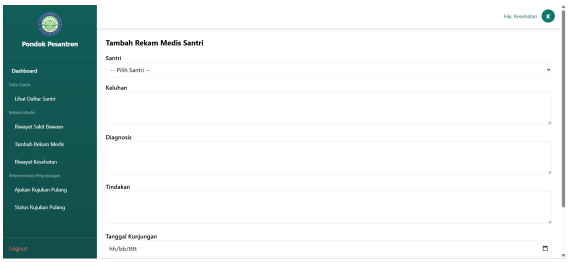

Figure 6. Healthcare Provider Dashboard

3.2.4 WhatsApp Notification Integration

The system incorporates WhatsApp notification integration to enhance communication between the Islamic boarding school and students' guardians. This feature is applied in two main contexts: the delivery of information regarding student violations and the processing of permission requests.

For violation notifications, the system automatically generates and sends a message to the guardian's registered WhatsApp number. The message includes the student's name, the date of the incident, the type of violation, and any sanctions imposed, as illustrated in Figure 7.

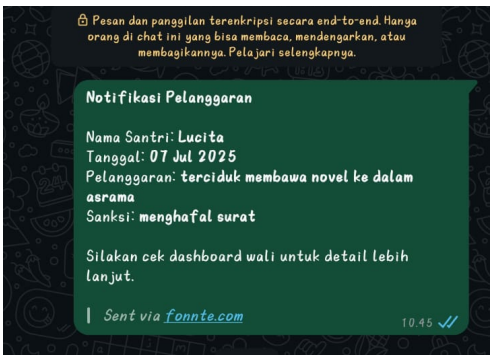

Figure 7. WhatsApp Violation Notification

For permission notifications, each request submitted by a guardian is forwarded to the admin's WhatsApp account for prompt follow-up. The forwarded message contains the student's identity, the type of permission, and the date of the request, as shown in Figure 8. This integration ensures that critical information is delivered quickly, clearly, and is well-documented for future reference.

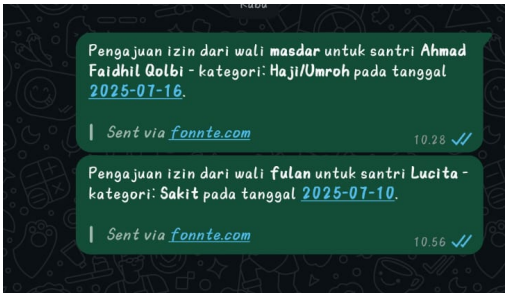

Figure 8. WhatsApp Permission Notification

3.3 Testing

System testing was conducted to ensure that all features functioned as intended and met user requirements. The User Acceptance Test (UAT) method was used, focusing on three main user groups: Admins/Caregivers, Student Guardians, and Health Staff. Each group evaluated the system's usability, functionality, and relevance to their respective roles using a structured questionnaire. The test results for each user role are presented in the following subsections.

3.3.1 Admin UAT Results

UAT for the admin role was conducted with one respondent using a questionnaire of eight items assessing ease of use, feature completeness, and system suitability. All items received the maximum score of 5 (100% satisfaction). According to the UAT evaluation criteria, these results fall into the Excellent category, indicating that the system fully meets admin requirements.

Questionnaire for Admin:

1. Login and logout can be performed easily.
2. Managing student data (add/edit/delete) runs according to needs.
3. Managing guardian accounts can be done easily.
4. Recording student violations is easy to use.
5. Recording student achievements works properly.
6. The process of reviewing & approving leave requests runs according to flow.
7. Student health history information can be viewed properly.
8. Reviewing referral approvals from health staff can be performed smoothly.

Tabel 3. Admin UAT Results

Question	Score	Average	Percentage

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1	5	5	100%
2	5	5	100%
3	5	5	100%
4	5	5	100%
5	5	5	100%
6	5	5	100%
7	5	5	100%
8	5	5	100%
Rata-rata			100%

3.3.2 UAT Results for Student Guardians

The trial involving 30 student guardians was conducted using a questionnaire of seven items assessing ease of use, convenience, and feature suitability. The average satisfaction percentage was 87.05%, which falls into the Excellent category. These findings indicate that the system effectively supports the needs of student guardians. Although slight variations occurred in each aspect, all values remained in the high category.

Questionnaire for Student Guardians:
1. Login and logout can be performed easily.
2. Guardian and student profile data can be viewed clearly.
3. Information about student violations is easy to access and understand.
4. Information about student achievements is easy to view.
5. Leave request submissions can be performed smoothly.
6. Student health history can be viewed easily.
7. Referrals for leaving submitted by health staff and approved by admin can be reviewed clearly.

Table 4. UAT Results for Student Guardians

Question	Score	Average	Percentage
1	134	4.46	89.33%
2	130	4.33	86.67%
3	125	4.16	83.33%
4	132	4.4	88%
5	130	4.3	86.67%
6	135	4.5	90%
7	128	4.26	85.33%
Average			87.05%

3.3.3 UAT Results for Health Staff

Testing for health staff was conducted with one respondent using a questionnaire of six items assessing medical record keeping, referral submission, and system feature suitability. All items received the maximum score of 5 (100% satisfaction). According to the UAT evaluation criteria, these results fall into the Excellent category, confirming that the system successfully meets all the needs of health staff, particularly in medical record management and student health services.

Questionnaire for Health Staff:
1. Login and logout can be performed easily.
2. Student data can be displayed and searched quickly.
3. Recording student medical records can be done easily.
4. Diagnoses and treatments of students can be recorded properly.
5. Student medical history can be recorded and viewed accurately.
6. Referral recommendations for leaving students can be submitted smoothly to the admin.

Table 5. UAT Results for Health Staff

Question	Score	Average	Percentage
1	5	5	100%
2	5	5	100%
3	5	5	100%
4	5	5	100%
5	5	5	100%
6	5	5	100%
Average			100%

After conducting the UAT across all user groups, the results consistently showed high satisfaction levels, with an overall average rating categorized as Excellent according to the assessment criteria presented in Table 2 (Likert Scale Weight). Administrators and health staff both achieved 100% satisfaction, while student guardians scored 87.05%. These findings indicate that the system is effective, user friendly, and capable of supporting the administrative and communication needs of all roles within the boarding school. Therefore, the testing outcomes validate that the Web-Based Santri Management and Monitoring System integrated with WhatsApp successfully meets functional, usability, and communication

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requirements before entering the maintenance stage.

3.4 Maintenance

Following testing, the system entered the maintenance phase. Corrective maintenance addressed minor bugs and optimized database queries, while adaptive maintenance incorporated user feedback from UAT. Improvements included enhanced dashboard analytics, more detailed notification logs, and validation enhancements to further improve usability and system reliability. These measures ensure the system remains effective and responsive to user needs within the boarding school environment.

4. CONCLUSIONS

The web-based Student Management and Monitoring System with WhatsApp notifications was successfully developed using the Waterfall method. UAT results showed high user satisfaction: 100% for admins, 87.05% for student guardians, and 100% for health staff, confirming that the system meets functional and usability requirements. The system improves efficiency in managing student data, including violations, achievements, permissions, and health records, while WhatsApp notifications provide real-time communication with guardians.

To ensure sustainability, routine maintenance such as database backups, software updates, and performance monitoring has been implemented. Future development may include a mobile version, additional user roles such as dormitory supervisors, and integration with finance and academic modules to support comprehensive and sustainable boarding school data management.

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