

## Al-Istiqomah Islamic Boarding School Academic Information System Based on the Waterfall Model

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**ABSTRACT** – This article discusses the development of a web-based Academic Information System (AIS) for Istiqomah Islamic Boarding School using the Laravel framework. The main objective of this study is to create an integrated and efficient system to manage student academic data, including grades, report cards, attendance, and information about both instructors and students at Al-Istiqomah Islamic Boarding School. The research method used is Research and Development (RnD) with a waterfall approach, starting from requirements analysis, system design, implementation, and testing. Data collection was carried out through interviews with pesantren administrative staff and observation of ongoing academic processes. The findings of the study show that the AIS developed successfully facilitates the digital management of academic data, reducing reliance on manual note-taking, which is prone to errors and slow. The system provides essential modules such as student data management, grade input, attendance recapitulation, student financial reports, and class schedules. System testing using the black box testing method shows that all functions are operating well and meeting the needs of the user. Thus, this system is expected to increase efficiency and accuracy in the management of academic information, as well as support better decision-making at the Istiqomah Islamic Boarding School.

**Keywords:** Information System, Laravel, Website

## Sistem Informasi Akademik Pondok Pesantren Al-Istiqomah Berbasis Waterfall

**ABSTRAK** – Artikel ini membahas tentang pengembangan Sistem Informasi Akademik (SIA) berbasis web untuk Pondok Pesantren Istiqomah dengan menggunakan framework Laravel. Tujuan utama dari penelitian ini adalah untuk membuat sistem yang terintegrasi dan efisien untuk mengelola data akademik siswa, meliputi nilai, rapor, absensi, serta informasi tentang pengajar dan siswa di Pondok Pesantren Al-Istiqomah. Metode penelitian yang digunakan adalah Research and Development (RnD) dengan pendekatan waterfall, dimulai dari analisis kebutuhan, perancangan sistem, implementasi, dan pengujian. Pengumpulan data dilakukan melalui wawancara dengan staf administrasi pesantren dan observasi terhadap proses akademik yang sedang berlangsung. Hasil penelitian menunjukkan bahwa SIA yang dikembangkan berhasil memfasilitasi pengelolaan data akademik secara digital, mengurangi ketergantungan pada pencatatan manual yang rentan terhadap kesalahan dan lambat. Sistem menyediakan modul-modul penting seperti pengelolaan data siswa, input nilai, rekapitulasi absensi, laporan keuangan siswa, dan jadwal kelas. Pengujian sistem dengan metode black box testing menunjukkan bahwa semua fungsi berjalan dengan baik dan memenuhi kebutuhan pengguna. Dengan demikian, sistem ini diharapkan dapat meningkatkan efisiensi dan akurasi dalam pengelolaan informasi akademik, serta mendukung pengambilan keputusan yang lebih baik di Pondok Pesantren Istiqomah.

**Keywords:** Laravel, Sistem Informasi, Website

## 1. INTRODUCTION

Islamic boarding schools as Islamic educational institutions have an important role in shaping the character and intellect of the younger generation. Along with the rapid development of information technology, the management of academic data in Islamic boarding schools faces challenges of complexity and efficiency [1]. Manual recording that has been widely applied, both for grades, attendance, student data, and ustadz data, often causes various obstacles, including being prone to errors, taking a long time in the recapitulation process, difficulties in reporting accurate data, and delays in presenting information to parties in need. This has an impact on the effectiveness of administrative processes and strategic decision-making in the Islamic boarding school environment [2].

In the context of scientific development, the adoption of information technology in education has been widely studied and applied, including in the development of academic information systems in various educational institutions [3]. The web-based approach is a popular choice because of its ease of access from anywhere and anytime, and it supports better data integration. Laravel, as one of the modern and popular PHP frameworks, offers a wide range of features and tools that facilitate the development of complex, scalable, and secure web applications. Information systems theory emphasizes the importance of the system development lifecycle (SDLC) to ensure that the system built is in accordance with the needs of the user and of high quality [4]. The concept of relational databases is also the main foundation in designing efficient data structures to store and manage academic information

Several previous studies have shown that the implementation of academic information systems can improve administrative efficiency, data accuracy, and quality of educational services. However, there are still gaps in research that specifically discusses the development of an academic information system that is tailored to the unique characteristics of Islamic boarding schools, including the management of typical pesantren report cards, attendance that is integrated with religious activities, and data on ustadz who also act as mentors. This research seeks to fill this gap by presenting an academic information system specifically designed to meet the needs of the Istiqomah Islamic Boarding School.

Based on the background of the problem and the literature review, this study focuses on the development of an integrated Laravel application-based Academic Information System for the Istiqomah Islamic Boarding School. The promised scientific contribution of this research is the creation of an academic information system model that is not only efficient and accurate, but also adaptive to the

specific needs of Islamic boarding schools, so that it can be a reference for similar educational institutions in efforts to modernize data management [2]. This system is expected to be a concrete solution to overcome manual administrative constraints and improve the quality of educational services at the Istiqomah Islamic Boarding School.

## 2. LITERATURE REVIEW

### 2.1. Academic Information Systems

Academic Information System (AIS) is a system designed to manage data and information related to academic activities in an educational institution. According to McLeod & Schell (2007), an information system is a system that collects, processes, stores, analyzes, and disseminates information for a specific purpose. In an academic context, AIS serves to automate processes such as enrollment, value management, attendance, curriculum, and reporting. Effective implementation of AIS can improve operational efficiency, data accuracy, and ease of access to information for all parties involved, including students, teachers, and management.

So basically Information Systems (IS) is an integrated framework designed to manage, process, store, and distribute information within a specific organization or environment. The system combines components such as humans (brainware), technology (hardware & software), data, and procedures to produce accurate, relevant, and timely information to support operations, decision-making, and business strategy. Information systems are not only limited to aspects of computer technology, but also include human interaction, workflows, and organizational policies. The goal is to improve efficiency activity, productivity, and competitiveness by turning raw data into useful knowledge [5].

Pesantren is a traditional Islamic educational institution that has unique characteristics, combines religious and general education, and emphasizes moral and spiritual aspects. The organizational structure, curriculum, and management system in Islamic boarding schools are often different from other formal educational institutions [6]. Therefore, the development of pesantren information systems requires a deep understanding of the ecosystem and its specific needs, such as comprehensive student data management, attendance recording that is integrated with religious activities, and an assessment system that includes academic and moral aspects. Islamic boarding schools are unique areas whose characteristics are not shared by other regions. Therefore, it is not an exaggeration if Abdurrahman Wahid calls it a separate sub-culture. The elements contained in the traditional pesantren education system that make it unique are kiai, students,

mosques, Islamic boarding schools and the teaching of classical books.

Al-Istiqomah Islamic Boarding School is a traditional Islamic educational institution (pesantren) located in Sumberharjo Village, East Buay Madang District, OKUT Regency, which integrates the Islamic religious curriculum with formal education or life skills. The name Al-Istiqomah is derived from the Arabic language (Integrity) which means "consistency" or "steadfastness on the straight path", reflects the vision of the pesantren to form students who are firm in their faith, worship, and morals.

A. Characteristics of Al-Istiqomah Islamic Boarding School:

1) Religious Education

Teaching the knowledge of the Qur'an, Hadith, Fiqh, Nahwu Shorof, and others. The learning method can be in the form of sorogan, bandongan, or memorization (tahfiz).

2. Dormitory System (Cottage)

The students live in the pesantren complex for 24-hour character building. Discipline in worship (congregational prayers, fasting, dhikr).

3. Integrated Curriculum

Some Al-Istiqomah Islamic boarding schools combine formal junior and senior high school education with the teaching of yellow books. There are also those that focus on special programs such as tahfizul Qur'an.

4. The Value of "Istiqomah"

Istiqomah in pesantren is determination and consistency in carrying out the teachings of Islam as well as the rules and activities of the pesantren in a sustainable, non-stop or changing manner. It's not just about doing something once, but making it a habit and an indispensable part of everyday life.

5. Social Environment

Building Islamic brotherhood between students from various regions. Extra activities such as bahtsul masail, khitobah, or Islamic art.

## 2.2 Laravel Framework

Laravel is an open-source PHP web application framework that follows the Model-View-Controller (MVC) architectural pattern. Known for its elegant and expressive syntax, Laravel provides a variety of built-in features that speed up the web application development process, such as routing systems, ORM (Eloquent), template engines (Blade), authentication systems, and middleware. Laravel's advantages in building scalable, secure, and easy-to-maintain applications make it a great choice for developing complex information systems. Laravel also has a large developer community and extensive documentation, facilitating the process of continuous troubleshooting and development [6].

Several studies have examined the development of academic information systems in various

educational institutions. For example, the research of Putra and Nurhayati (2020) developed a web-based AIS for secondary schools that is able to improve the efficiency of student and classroom data management. Another study by Wibowo and Wijaya (2019) analyzed the implementation of AIS in universities that focuses on the integration of student and lecturer data. Meanwhile, there are also studies that discuss information systems for Islamic boarding schools, but often focus more on financial management or asset management aspects, rather than on comprehensive academic information systems.

A gap in previous research is the lack of focus on the development of Academic Information Systems specifically designed to meet the unique characteristics and needs of Islamic boarding schools, including the management of typical pesantren report cards, attendance that includes religious activities, and data information of ustadz who also play the role of teachers and spiritual guides [7]. This research aims to fill this gap by building a customized and comprehensive Laravel-based AIS for the Istiqomah Islamic Boarding School, taking into account all these aspects. It will make a new contribution to the literature on the development of information systems for Islamic educational institutions.

## 3. METHOD

The methods used by the researcher in this study are as follows:

### 3.1. Types and Approaches to Research

This research uses the Research and Development (RnD) method with a qualitative approach. The RnD method was chosen because it aims to produce a new product, namely a web-based Academic Information System, and to test its effectiveness and feasibility. A qualitative approach is used to deeply understand user needs, business process flows at the Istiqomah Islamic Boarding School, and input during the development and testing stages of the system. The development model used is the Waterfall model, which consists of sequential stages: needs about analysis, design, implementation, testing, and maintenance.

### 3.2. Setting and Research Subjects

This research was conducted at the Istiqomah Islamic Boarding School. The research setting is the administrative and academic environment of the Islamic boarding school, where the process of managing student data, ustadz, grades, absences, and report cards takes place. The subjects of the study include administrative staff of the Istiqomah Islamic Boarding School who are directly involved in the management of system academic data, several representatives of ustadz/ustadzah who teach, and

student representatives as end users of the system [8]. The selection of this subject is based on its role in providing relevant information related to the needs and functionality of the system to be developed.

### 3.1. Data Collection Techniques

The data collection techniques used in this study include:

#### 1. Interview

Interviews were conducted with the administrative staff of the Islamic boarding school and representatives of the ustadz to gather information about the current academic data management workflow, the obstacles faced, and the expectations and functional needs of the system to be built.

#### 2. Observation

Observations were carried out to directly observe the academic and administrative processes that took place at the Istiqomah Islamic Boarding School, such as recording scores, attendance recapitulation, and preparation of report cards. These observations aim to gain a more accurate contextual understanding of the system environment.

#### 3. Documentation Studies

Data collection is also carried out through a review of related document documentation such as the report card format used, student list, list of ustadz, and academic regulations of Islamic boarding schools. Data analysis collected from interviews, observations, and documentation studies was analyzed qualitatively descriptively. The stages of data analysis include:

##### a. Needs Analysis

Identify the needs of functional and non-functional systems based on information obtained from interviews and observations.

##### b. Current System Analysis

Understand current workflow and data management processes to identify the advantages and disadvantages of manual systems that will then be the basis for improvements on new systems.

##### c. System Design

The results of the analysis are used to design system architecture, databases, user interfaces, and process flows in the form of UI/UX designs. System Testing.

The implemented system is tested using a black box testing method to ensure that all functionality runs according to predetermined specifications and needs. This test involves a test scenario that includes every feature in the system.

## 4. RESULT

This research aims to develop a web-based Academic Information System (AIS) for Al-Istiqomah Islamic Boarding School using the Laravel

framework. The development process is carried out through the Research and Development (R&D) stage with a waterfall approach, starting from needs analysis to system testing. The results of this study describe the system products produced, their functionality, and system evaluation.

### 4.1 Needs Analysis and System Design

The initial stage of the research involves an in-depth analysis of the needs of the Al-Istiqomah Islamic Boarding School related to academic data management. From interviews with administrative staff and observations of existing manual workflows, it was found that Islamic boarding schools face difficulties in summarizing data, grades, absences, and student payments that are still done conventionally using books and worksheets. These difficulties often result in recording errors, late reporting, and time inefficiencies. Key needs identified include:

Student data management module (input, edit, delete, search).

- a) Al-Istiqomah Islamic Boarding School Dashboard
- b) Student Data Management Module
- c) Ustadz Data Management Module
- d) Lesson Schedule List Module
- e) Attendance Management Module
- f) Report Card Data Management Module
- g) Subject Matter Management Module
- h) Financial Management Module

Based on this needs analysis, a system design is carried out which includes database design (ERD), user interface design (UI/UX), and system architecture. The design is carried out with user-friendliness, data security, and future system scalability in mind.

### 4.2 Application of Laravel-Based Academic Information Systems

The Academic Information System (AIS) was developed using the Laravel framework version 8 as the backend and HTML, CSS (Tailwind CSS), and JavaScript as the frontend. The database uses MySQL. The implementation of the system results in the following main modules.

#### a. Student Management Module

This module allows administrative staff to add, edit, delete, and search detailed student data, including personal information, parent/guardian data, education history, and activity status. Each student has a unique profile that facilitates identification and management as shown in Figure 1.

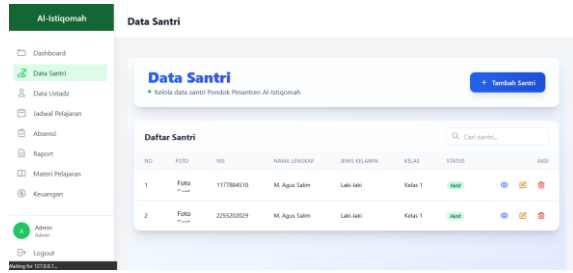


Figure 1. Picture of the student module

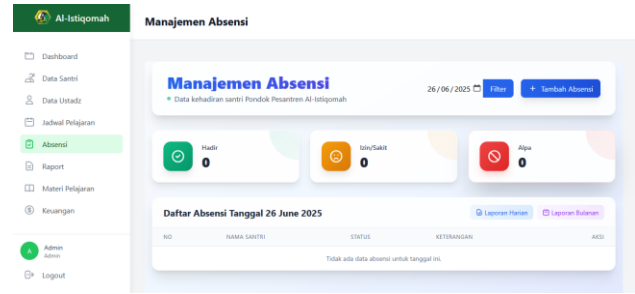


Figure 4. Attendance module

## b. Ustadz Management Module

This module provides features to manage ustadz data, including personal information, subjects taught, and activity status. This module is important for organizing teaching tasks and can facilitate communication between ustadz as shown in Figure 2.

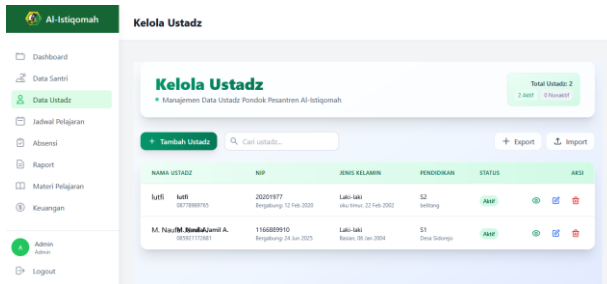


Figure 2. Images of ustadz module

## c. Grade Management and Report Card Module

This module allows ustadz to enter daily grades, exam scores (mid-semester and final semester) for each subject. The system automatically calculates the average score and generates a printable electronic report card. The format of the report card is adjusted to the needs of the Al-Istiqomah Islamic Boarding School, including the assessment of non-academic aspects such as morals and extracurricular activities as shown in Figure 3.



Figure 3. Report card module image 1.3

## d. Student Attendance Module

This module facilitates daily student attendance recording. Ustadz or duty officers can record the status of attendance (attendance, illness, permission, alpha). The system provides a feature to summarize attendance by period (weekly, monthly, semester) and generate attendance reports, facilitating monitoring of student discipline as figure 4.

## e. Lesson Schedule Module

This module facilitates the comprehensive management of lesson schedules. Ustadz or officers on duty can record and arrange lesson schedules for each class or student. The system provides features for creating, editing, and deleting schedules, as well as generating schedule reports per period (daily, weekly, monthly, or semester). This aims to facilitate the monitoring of discipline and the smooth teaching and learning process as shown in Figure 5.

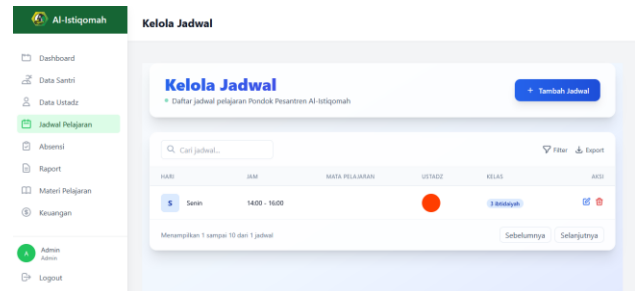


Figure 5. Lesson schedule

## f. Finance Module

This module facilitates the recording and financial management of Islamic boarding schools in a structured and transparent manner. Assigned officers can record various types of financial transactions, such as income (from trustees or other sources) and expenses. This system provides a feature to summarize financial statements by period (weekly, monthly, semester), as well as generate transparent reports for accountability to stakeholders, such as trustees and other related parties. This helps in identifying and managing future financial risks. This module also includes features for creating, editing, and viewing financial transaction details such as figure 6.

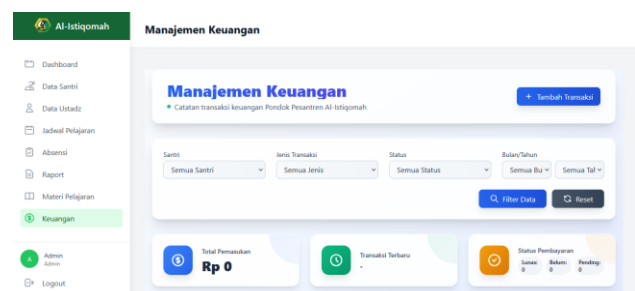


Figure 6. Picture of the finance



### g. Subject Matter Module

This module facilitates the management of subject matter that will be delivered to students. Ustadz or Islamic boarding school administrators can upload and manage subject matter in various formats (e.g., documents, presentations, or videos). The system provides a feature to summarize and organize materials by class, subject, or education level. This module can also assist teachers in preparing teaching materials, as well as facilitate students' access to subject matter anytime and anywhere as shown in Figure 7.

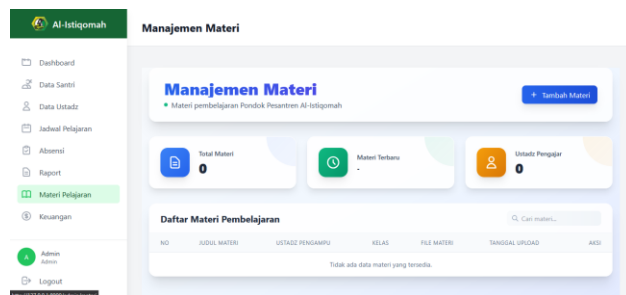


Figure 7. Picture of the module of the subject matter

### h. Dashboard Mode

This module is the main page or "homepage" that provides an overview and summary of important data from the entire system. The dashboard displays key metrics in the form of information cards and graphs for easy monitoring. On this dashboard, you can see the following information.

- **Total Students:** The total number of registered students, complete with the percentage change from the previous month.
- **Total Ustadz:** The total number of registered ustadz, with a status indicator of "Stable".
- **Today's Attendance:** The percentage of student attendance today is in the form of a progress bar.
- **This Month's Financials:** The total income or financial balance for the current month, complete with a percentage increase from the previous month.
- **Weekly Attendance Graph:** Visualization of graphs that show the trend of student attendance every week.
- **Distribution of Students by Class:** A pie or donut-shaped graph that shows the distribution of the number of students in each class.

Overall, this dashboard functions as a quick information center that helps administrators to monitor the operational status of Islamic boarding schools, ranging from student and ustadz data, attendance, to financial conditions as shown in Figure 8.

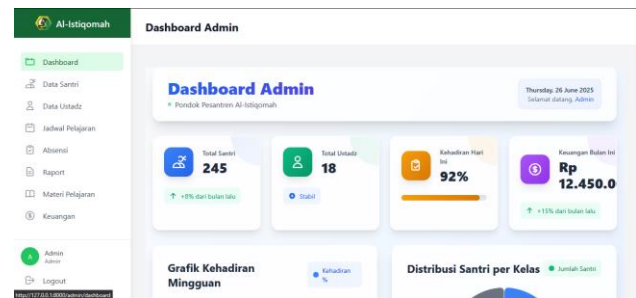


Figure 8. Dashboard module

## 3. System Testing

System testing is conducted using the black box testing method to verify the functionality of each module. The test results show that all the features developed are working properly and in accordance with the specifications that have been set. No critical bugs were found that interfered with the core functionality of the system [9]. The test also involved several administrative staff and ustadz as users to get initial feedback on the ease of use and suitability of the system with their workflow. Feedback from early adopters has been generally positive, indicating that the system is intuitive and easy to operate after a brief training.

Overall, the development of the Laravel-based Academic Information System has succeeded in presenting an effective and efficient academic data management solution at the Al-Istiqomah Islamic Boarding School. The system has successfully facilitated the transition from manual to digital recording, reducing the potential for errors, improving data accuracy, and speeding up the information reporting process. Thus, this system is expected to contribute significantly to improving operational efficiency and the quality of educational services at the Al-Istiqomah Islamic Boarding School.

## 5. DISCUSSION

This discussion interpreted the results of the development of a Laravel-based Academic Information System (AIS) for the Al-Istiqomah Islamic Boarding School, compared it with the findings of previous research, integrated it into an established body of knowledge, and identified the implications of the research results.

### 1. Interpretation of Data Analysis and System Development Results

The results of the study show that the AIS developed has succeeded in overcoming the main problems faced by the Al-Istiqomah Islamic Boarding School, namely inefficiency and inaccuracy in the management of manual academic data. The implementation of modules such as student management, ustadz, grades, attendance, finance, and lesson schedules significantly improves operational efficiency [10]. Digitizing this process

reduces the workload of administrative staff, minimizes recording errors, and accelerates access to information [11]. For example, an attendance recapitulation that previously took hours can now be generated in seconds. Similarly, the creation of electronic report cards that are adjusted to the typical format of Islamic boarding schools shows that this system is adaptive to the specific needs of Islamic educational institutions. The successful black box testing confirms that all system functionality is running according to the expectations and specifications that have been set.

## 2. Comparison with Previous Research Findings

The success of AIS development is in line with previous research findings that show that the adoption of information systems can improve administrative efficiency and data accuracy in educational institutions [12]. However, this research is new and fills in the gaps from previous research. Most AIS research tends to focus on formal schools or universities that have common characteristics. This research specifically targets Islamic boarding schools by considering the uniqueness of academic and non-academic processes in them, such as report card formats that include moral values and religious activities, as well as the management of Ustadz data who has a dual role as a teacher and mentor. The use of the Laravel framework is also a differentiator, offering better scalability and maintenance compared to developing a system from scratch [13].

## 3. Integration of Research Results into Established Knowledge Bodies

The results of this study enrich the body of knowledge in the field of information systems and education. Theoretically, the implementation of AIS supports the concept of the Information Systems Success Model proposed by DeLone and McLean, in which system quality, information quality, and service quality contribute to user satisfaction and positive organizational impact [8]. In this regard, Laravel-based AIS has demonstrated good system quality through stable and user-friendly functionality, accurate and real-time information quality, and improved service quality through process efficiency. This research also confirms the effectiveness of the waterfall development model in system development projects that have clear requirements from the beginning 4.

The implications of the results of this study are very significant, especially for the Al-Istiqomah Islamic Boarding School and similar Islamic educational institutions. First, in practice, this system allows the Al-Istiqomah Islamic Boarding School to carry out digital transformation in academic data management, reducing reliance on manual methods that are prone to errors and inefficiencies [14]. This will

free up administrative staff's time to focus on more strategic tasks. Second, this system can increase data transparency and accountability, both for the management of Islamic boarding schools, ustadz, students, and student guardians. Third, from the academic side, the results of this research can be a reference and case study for other information system developers who want to create technological solutions for non-formal educational environments such as Islamic boarding schools, by paying attention to cultural aspects and special needs of institutions [15]. The potential for further development, such as integration with a biometric attendance system or an independent portal for student guardians, is also wide open, promising continuous efficiency improvements.

## 6. CONCLUSION

This research has succeeded in developing a web-based Academic Information System (AIS) using the Laravel framework which is specifically designed to meet the needs of Al-Istiqomah Islamic Boarding School. The resulting system has proven to be effective in changing academic data management from inefficient manual methods to a more accurate, fast, and transparent digital system. The main modules such as student and ustadz data management, grade and report card management, attendance recording, all work optimally and have passed the black box test with satisfactory results. The success of this implementation shows a significant increase in operational efficiency and information accuracy, which in turn supports better decision-making in the Islamic boarding school environment. This approach also fills a gap in previous research by focusing on adapting information systems to the unique characteristics of traditional Islamic educational institutions. Thus, this Laravel based one not only provides a practical solution for the Al-Istiqomah Islamic Boarding School, but also enriches the body of knowledge in the field of educational information systems, especially for the context of Islamic boarding schools. This system is expected to be a foundation for further development and an inspiration for similar institutions in adopting technology to improve the quality of administration and education.

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