

***DESIGN OF A WEB-BASED STUDENT ATTENDANCE INFORMATION  
SYSTEM USING QR CODE/BARCODE***

**PERANCANGAN SISTEM INFORMASI ABSENSI SISWA BERBASIS WEB  
MENGUNAKAN CODE QR/BARCODE**

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**ABSTRACT**

*The application of information technology in the field of education plays an important role in improving the effectiveness of academic data management, particularly in the student attendance process. Manual attendance systems that are still widely used in schools have several weaknesses, including a high risk of recording errors, low efficiency, and difficulties in processing and reporting attendance data. This study aims to design a web-based student attendance information system that supports fast, accurate, and integrated attendance recording. The research methodology includes requirements analysis, system design using Unified Modeling Language (UML), and the implementation of a web-based system with a centralized database. The developed system provides features for managing student data, teacher data, class schedules, attendance recording, and automatic report generation. The results of this study indicate that the web-based student attendance information system can improve teachers' work efficiency and facilitate schools in monitoring student attendance in real time.*

**Keywords:** information system, student attendance, web-based, education.

**ABSTRAK**

Penerapan teknologi informasi dalam bidang pendidikan berperan penting dalam meningkatkan efektivitas pengelolaan data akademik, khususnya pada proses absensi siswa. Sistem absensi manual yang masih banyak digunakan di sekolah memiliki kelemahan, antara lain rawan kesalahan pencatatan, kurang efisien, serta menyulitkan dalam pengolahan dan pelaporan data kehadiran. Penelitian ini bertujuan untuk merancang sistem informasi absensi siswa berbasis web yang mampu mendukung proses pencatatan kehadiran secara cepat, akurat, dan terintegrasi. Metode penelitian yang digunakan meliputi analisis kebutuhan, perancangan sistem menggunakan Unified Modeling Language (UML), serta implementasi sistem berbasis web dengan basis data terpusat. Sistem yang dikembangkan menyediakan fitur pengelolaan data siswa, data guru, jadwal pelajaran, pencatatan absensi, dan penyajian laporan secara otomatis. Hasil penelitian menunjukkan bahwa sistem informasi absensi siswa berbasis web dapat meningkatkan efisiensi kerja guru dan mempermudah pihak sekolah dalam memantau kehadiran siswa secara real-time.

**Kata Kunci:** sistem informasi, absensi siswa, berbasis web, pendidikan.

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## INTRODUCTION

The rapid development of information and communication technology has encouraged digital transformation in various sectors, including education. The use of information technology in schools not only functions as a support tool for learning activities, but also serves as an important instrument in managing academic administration. Effective and efficient administrative management is needed to support the smooth implementation of the educational process and improve the quality of academic services for students.

One important aspect of academic administration is student attendance recording. Student attendance data play a strategic role as an indicator of students' discipline, participation, and responsibility in participating in learning activities. In addition, attendance data are also used as material for evaluating student performance, as a basis for assessment, and as reports to schools and parents. Therefore, an accurate and well-managed attendance system is highly necessary.

However, in practice, many schools still apply manual attendance systems using attendance books. This manual system has several limitations, including being prone to recording errors, data manipulation, archive loss, and requiring a relatively long time for recapitulation and report preparation. This condition can hinder the work performance of teachers and administrative staff and reduce the effectiveness of student attendance data management.

Along with technological development, web-based information systems have become one of the solutions that can be applied to overcome these problems. A web-based student attendance information system enables the attendance recording process to be carried out digitally with centralized and integrated data storage. In addition, a web-based system has advantages in terms of accessibility because it can be accessed through various devices and locations without being limited by time.

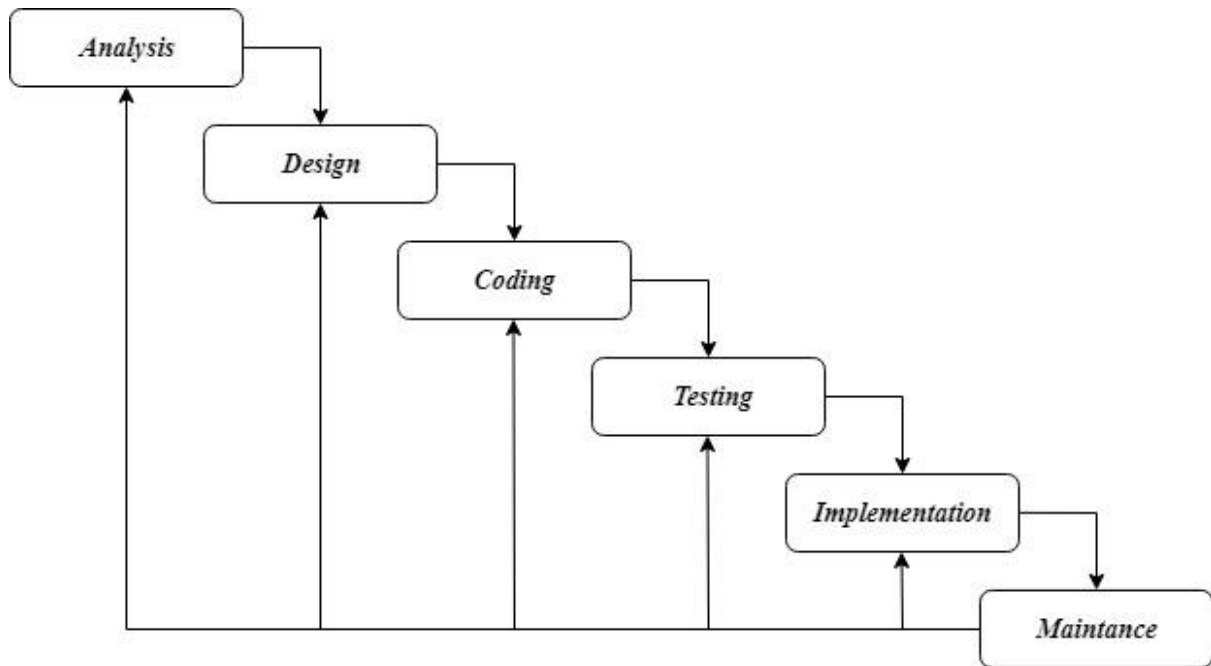
The implementation of a web-based attendance information system is expected to improve teachers' work efficiency in recording attendance, minimize data errors, and accelerate the processing and presentation of attendance reports. Schools can also monitor student attendance levels in real time, making it easier to make decisions related to discipline and academic policies.

Based on these problems, this study focuses on designing a web-based student attendance information system that meets school needs. The system design process is carried out through the stages of needs analysis, system design, and implementation using web-based technology. The designed system includes student data management, teacher data management, class schedules, attendance recording, and automatic generation of student attendance reports.

The development of this web-based student attendance system is integrated with QR Code technology and equipped with quantitative usability testing. Therefore, the system evaluation does not only emphasize functionality, but also the level of ease of use by teachers as the main users.

## METHODS

The system development method used in this study is the Waterfall method. The Waterfall method was chosen because it has structured and systematic development stages, making it easier to design and build a web-based student attendance information system.



**Figure 1.** Stages in the Waterfall Method.

Analysis is the initial stage in system, project, or program development that functions to deeply understand what users or organizations need. Its purpose is to ensure that the developed solution truly matches real needs and can solve existing problems.

### **1. Design**

This step evaluates how to create interfaces for each input, output, and process in the system, converting user requirements into application documents whose quality can be estimated before coding begins. This step serves as the design foundation to transform information from the analysis stage into a design that includes database design, software architecture, and user interface design.

### **2. Coding**

At this stage, the program code from the previously designed system is converted into software. The result of this stage is a computer program that conforms to the design formulated in the previous stage. In this study, the coding process uses the PHP programming language by utilizing the CodeIgniter framework and MySQLi database.

### **3. Testing**

The developed program needs to be tested first to ensure that it meets rational and functional requirements. This testing not only aims to reduce errors, but also to correct existing weaknesses.

### **4. Implementation**

At this stage, the plan, design, or program that has been created is executed or applied in real conditions so that it functions according to its objectives. In other words, implementation is the process of transforming a concept or design into reality.

### **5. Maintenance**

At this stage, maintenance is carried out on the application that has been built. Maintenance activities include correcting errors recorded in the previous stage, adjusting system unit implementation, and improving system services to meet new needs.

## **Data Collection**

The data collection method aims to obtain the required information systematically so that the analysis results and conclusions can be accounted for. The selection of an appropriate method greatly influences the quality of the data obtained.

### **Types of Data Collection Methods**

#### **1. Observation**

Observation is data collection conducted by directly observing the object or process being studied.

#### **2. Interview**

Interview is a data collection method carried out through direct question and answer sessions with informants to obtain more in-depth information.

#### **3. Questionnaire**

Questionnaire is data collection conducted by distributing a list of questions to respondents, either in written form or online.

#### **4. Documentation**

Documentation is data collection through existing documents or archives, such as reports, records, or statistical data.

#### **5. Literature Study**

Literature study is data collection from books, journals, articles, or other scientific sources relevant to the research topic.

## **Testing**

Testing is conducted by running the system directly to examine its functions, performance, and security. The main purpose of testing is to find errors or bugs, ensure that each feature works correctly, and guarantee the quality of the system so that it is ready for use. XAMPP is used as the testing environment because it provides a complete package such as Apache as the web server, MySQL/MariaDB as the database, and PHP, so the web application can be run and tested locally. By using XAMPP, developers can ensure that the system runs properly.

### **Testing Stages Using XAMPP**

#### **1. Running the Server**

Activating Apache and MySQL in the XAMPP Control Panel.

#### **2. Placing the Application**

Storing the web application files in the htdocs folder.

#### **3. Functional Testing**

Testing application features such as login, data input, attendance process, and reports through a browser.

#### **4. Database Testing**

Ensuring that data are stored, modified, and displayed correctly using phpMyAdmin.

#### **5. Error Testing and Debugging**

Checking errors that appear and making improvements to the program code.



**Figure 2.** Attendance Scan Page

Testing on the Attendance Scan page was conducted to ensure that the web-based attendance feature functioned properly according to system requirements. In this interface, users are given scan method options, namely Card Code and Barcode, as well as a URL input field and an Attend Now button.

#### Explanation of Testing Conducted

##### 1. Scan Method Selection Testing

Testing was carried out by selecting the Card Code and Barcode methods to ensure that the system could switch methods correctly and display the attendance process according to the user's selection.

##### 2. Data Input Testing

The URL input field was tested by entering valid and invalid addresses to ensure that the system could receive data correctly and display an appropriate response if an error occurred.

##### 3. Attend Now Button Testing

The Attend Now button was tested to ensure that the system could process attendance data and store them in the database after the button was pressed.

##### 4. System Validation Testing

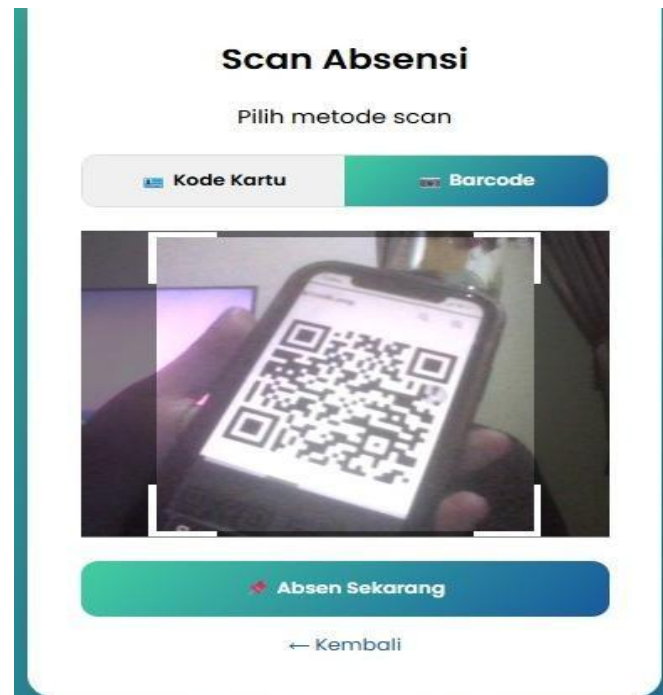
Testing was carried out to ensure that the system rejected attendance if the data were incomplete or invalid and provided appropriate notifications.

##### 5. Navigation Testing

The Back button was tested to ensure that users could return to the previous page without errors.

#### Testing Objectives

- To ensure that the attendance process runs smoothly
- To guarantee the accuracy of attendance data
- To ensure that the interface is easy to use
- To reduce errors during the attendance process



**Figure 3.** Successfully Scanned Code Page

Testing was conducted on the web-based Attendance Scan page running locally using XAMPP or localhost. This page functions to perform the attendance process using the Barcode or QR Code method.

### **Testing Explanation**

#### **1. Page Access Testing**

Testing was carried out by opening the scan.php page through a browser. The test results show that the page could be accessed properly without errors.

#### **2. Scan Method Selection Testing**

The Barcode method was selected and the system successfully activated the camera to scan the QR Code according to its function.

#### **3. Camera Testing or QR Code Scanner**

The camera was tested by pointing it at a QR Code displayed on another device. The system successfully detected and read the displayed QR Code.

#### **4. Attendance Process Testing**

After the QR Code was detected, the Attend Now button was tested to ensure that the system processed attendance data and sent them to the database.

#### **5. Data Validation and Storage Testing**

Attendance data were tested to determine whether they were stored correctly in the database through phpMyAdmin. The results showed that the data were successfully stored according to the time and user identity.

#### **6. Navigation Testing**

The Back button was tested to ensure that users could return to the previous page without errors.

## RESULTS AND DISCUSSION

This stage aims to study and evaluate the condition of the system currently being used before it is developed or improved, with the objective of identifying its strengths, weaknesses, and existing problems.

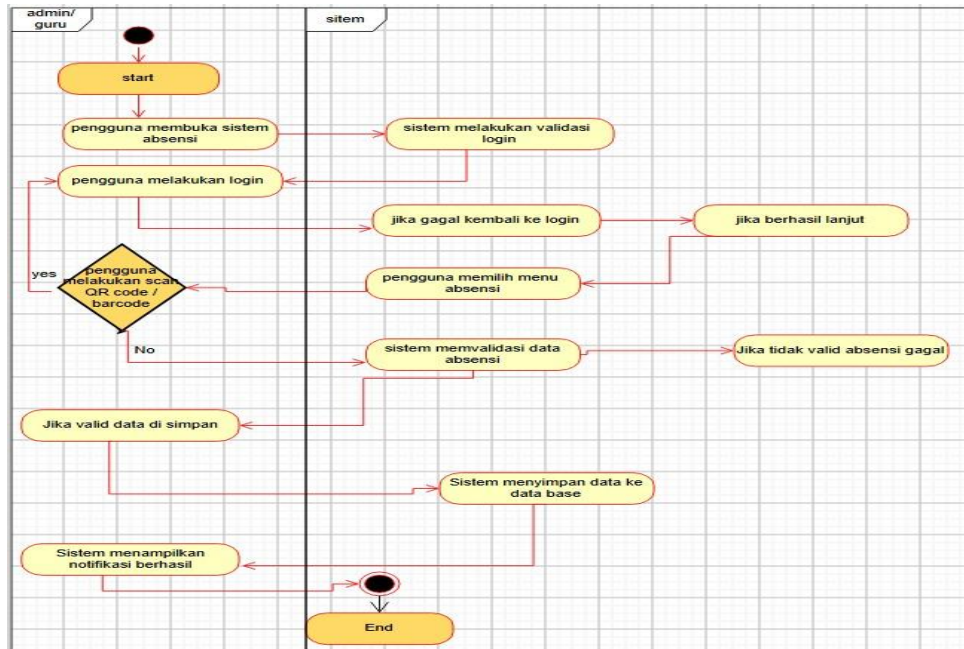


Figure 4. Activity Diagram of the Current Student Attendance Filling System

### System Requirements Analysis

At the analysis stage, an evaluation was carried out to determine the requirements of the planned system. Therefore, it can be concluded that several data requirements must be shown for the development of this system.

#### a. Admin

The Admin acts as the manager responsible for the following tasks:

1. The Admin has the ability to perform various actions, including adding, editing, and deleting user information.
2. The Admin can perform several tasks such as adding, monitoring, editing, and deleting information about students and teachers.
3. The Admin can access and print barcodes.
4. The Admin is authorized to set arrival and departure times.

#### b. Teacher

The Teacher acts as a user of the attendance system application whose task is to record student attendance by scanning the student's QR Code and providing additional notes in the attendance form for students who do not fill in attendance. The Teacher can view student attendance reports according to the subjects taught in class.

### General Overview of the Proposed System

The following is a summary of the currently implemented system and the proposed system.

**Table 1.** General Overview of the Proposed System

No.	Current System	Proposed System
1	The system runs manually	The system is built online and web-based
2	Data recording uses documents and Excel files	The storage medium uses a database
3	Attendance reports are reported every month	Attendance reports can be obtained at any time in real time

### Design of the Proposed System

1. The design of this online attendance system aims to improve efficiency, accuracy, and ease of recording user attendance. The proposed system uses the QR Code scan method so that the attendance process can be carried out quickly, securely, and automatically.
2. The system workflow begins when users log in to the system using their respective accounts. After successfully logging in, users are directed to the attendance menu on the dashboard. On the attendance page, users scan a QR Code using the device camera, either through a smartphone or laptop. The QR Code contains unique information about the user's identity and attendance time.
3. After the QR Code is scanned, the system validates the data to ensure that the QR Code is valid and that the user has not recorded attendance at the same time. If valid, the attendance data are stored in the database in real time, including user information, time, and attendance status. The system then displays a successful attendance notification to confirm the process. If an error occurs, such as an invalid QR Code, the system displays an error message so the user can try again.
4. This system also provides attendance report features for admins, enabling real-time attendance monitoring. Admins can view the list of present users, attendance time, and download digital reports for analysis or documentation purposes.
5. With this system design, the attendance process becomes more practical, accurate, and efficient compared with manual or paper-based systems. In addition, this QR Code system reduces the risk of data manipulation, accelerates attendance recapitulation, and facilitates data management by the administration.

### Unified Modeling Language (UML) Design

#### Use Case Diagram

The Use Case Diagram shows the expected functions of a system and aims to present interactions between actors and the system.

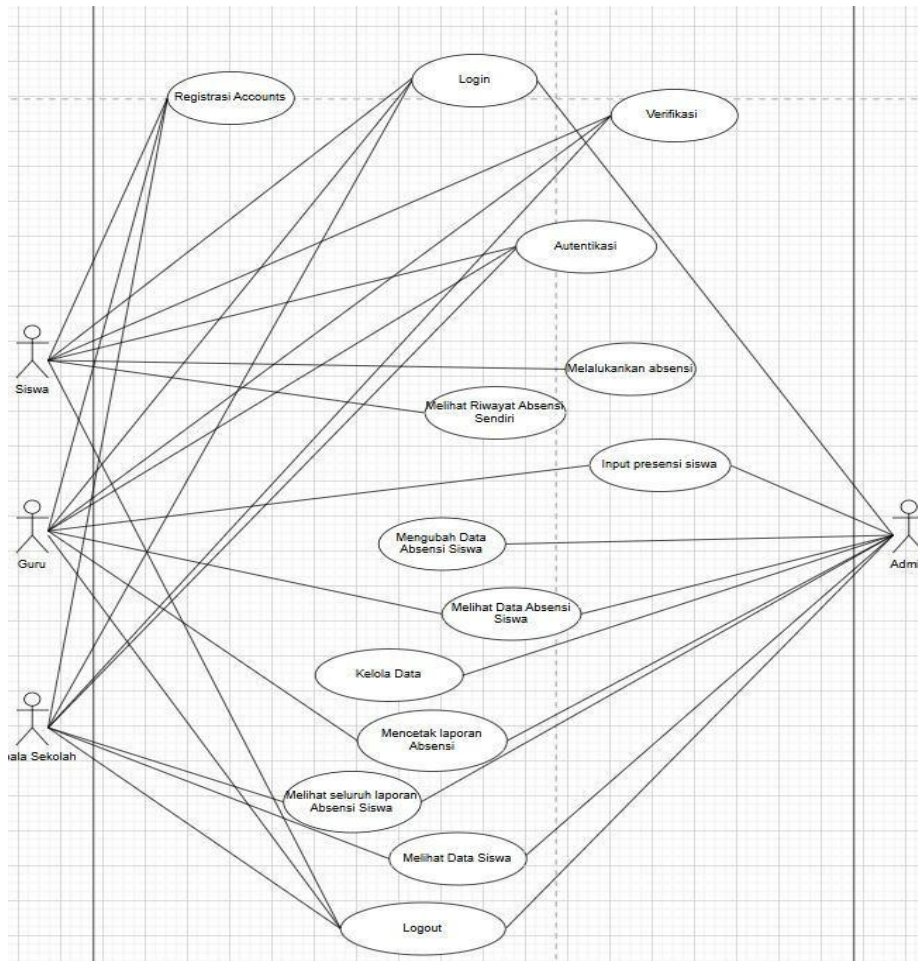


Figure 5. Use Case Diagram

**Activity Diagram**

The Activity Diagram is a diagram that shows the flow from one activity to another within a system.

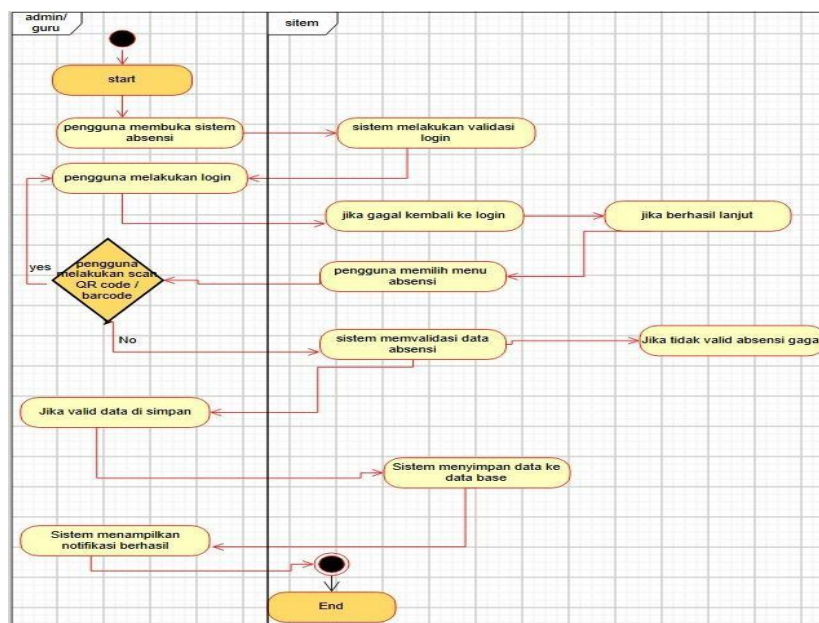


Figure 6. Activity Diagram

In order to take attendance, the teacher activates the barcode scanner and students record attendance by showing their QR Code. Student attendance is automatically recorded in the system, and the teacher checks attendance and provides notes for absent students through the system.

### Class Diagram

This diagram shows a collection of classes, interfaces, collaborations, and their relationships. Below is the class diagram for the web-based Student Attendance System using QR Code technology.

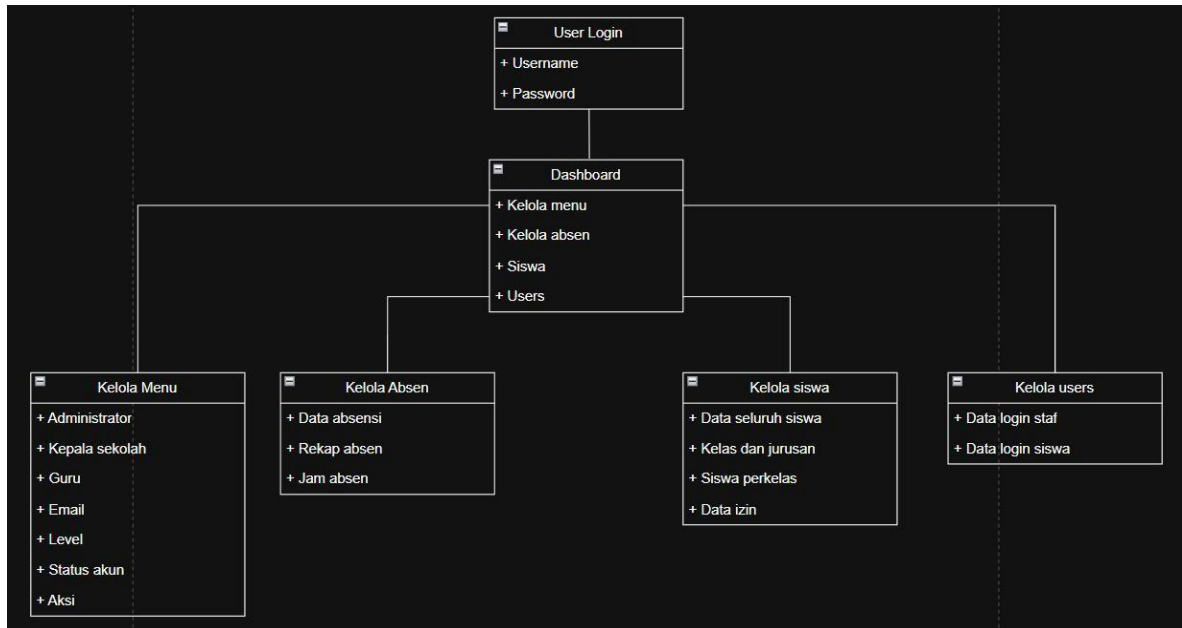


Figure 7. Class Diagram

### User Interface Design Implementation

User Interface implementation is the display of the application and the functions of each page. The following are the implementation displays of the application pages.

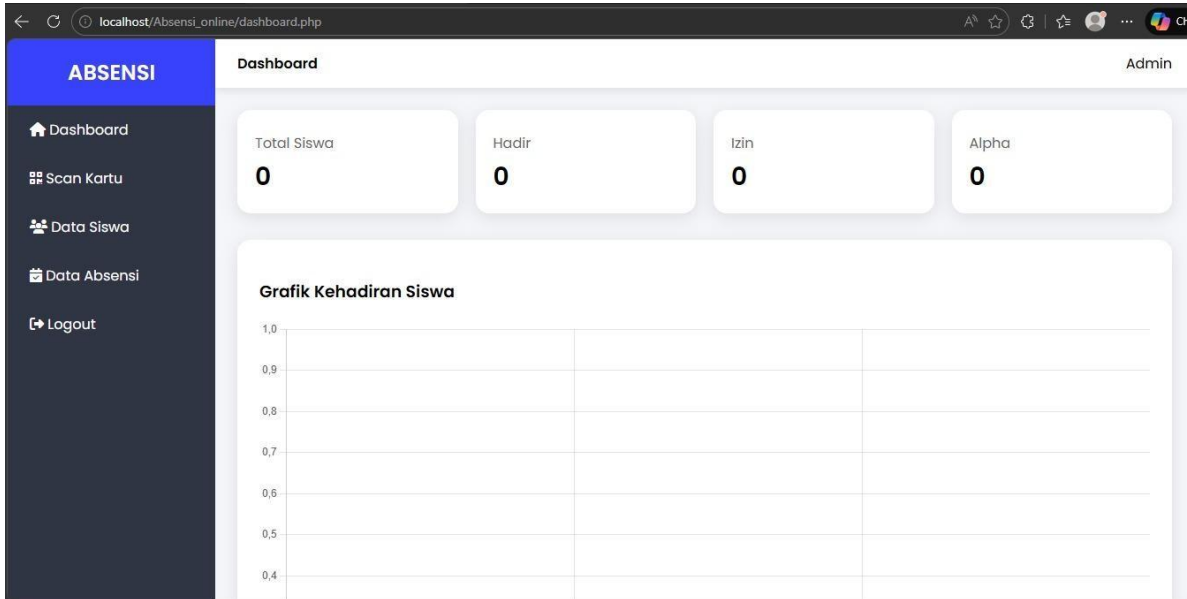
#### 1. User Login Interface

To access the application, teachers must log in. To log in, they fill in the username in the form of an email or NIP and the password that has previously been registered by the Admin.



Figure 8. Login Page

## 2. Home Page



**Figure 9.** Home Page

## 3. Student Attendance Setting Interface

This page is used to prepare attendance for students. If the time setting is appropriate, students can scan the barcode to record attendance.

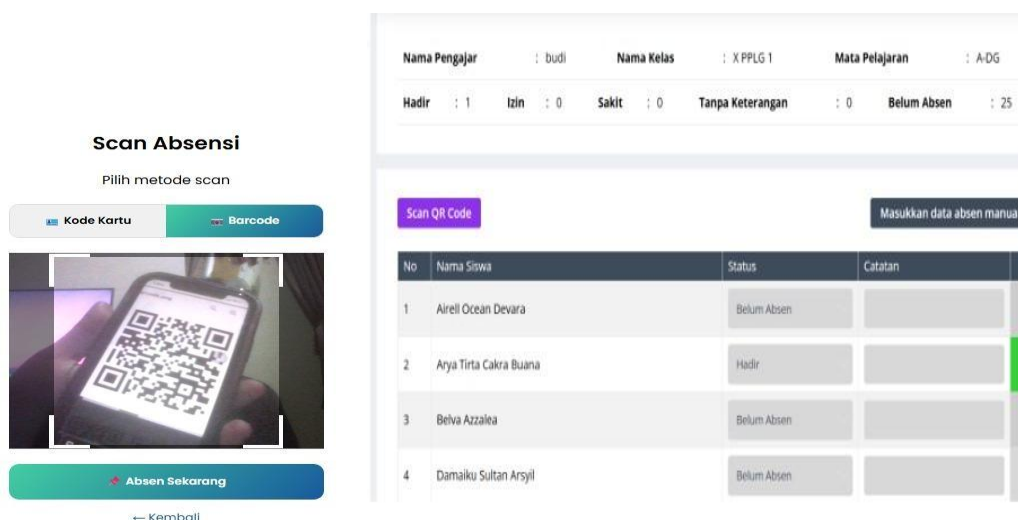
### Data Siswa



**Figure 10.** Student Attendance Setting Page

## 4. Student Attendance Presence Page Interface

This page is used by teachers for student attendance. There is a Scan QR Code button that can be activated to read the student's QR Code. If the code is read, the student's attendance data will be automatically saved. On this page, teachers can also enter attendance data manually to provide notes for students who are absent or whose QR Code cannot be scanned.



**Figure 11.** Student Attendance Presence Page

### Testing

To ensure whether the system functions according to the established procedures, testing was carried out. The testing applied used the XAMPP Testing method. The system testing results in Table 3 show that the system has run as expected.

**Table 3.** System Testing

Page	Description	Result
Login	Accessing the user page by entering the appropriate username and password	Successful
Admin	After logging in using the appropriate username and password, the admin dashboard page and navigation menu are displayed	Successful
Teacher	After logging in using the appropriate username and password, the teacher dashboard page and navigation menu are displayed	Successful
Student Attendance	This page can be accessed after the teacher sets attendance according to the teaching schedule and can then scan the student's QR Code	Successful
Attendance History Report	This page can be accessed by the teacher by entering the attendance date period to be displayed	Successful
Logout	Logging out the user who has logged in	Successful

To determine the quality or feasibility of the student attendance information system that has been built, usability instrument testing was carried out. The usability testing questionnaire was given to teachers to determine how effective, efficient, and satisfying the QR Code-based attendance information system was in supporting the student attendance process at school. The usability testing results are shown in Table 4.

**Tabel 4.** Usability Testing

No.	Question	Score
1	This system is easy to use, even for new users.	87
2	This system meets the needs of student attendance at school.	87
3	The system interface navigation, including menus, buttons, and pages, is easy to understand.	90
4	The use of the system helps reduce manual processes in attendance recording.	89
5	The system can read QR Codes quickly and accurately.	81
6	The displayed attendance information matches the entered data.	95
7	All features in the system can be used properly.	85
8	The system responds quickly without disturbing delays.	81
9	I am satisfied with the design of this system interface.	80
10	Overall, I am satisfied using this system.	80
	<b>Total Score</b>	855

The calculation of the usability value obtained a total score of 855 with a percentage of 85.5%. The conversion of this value resulted in the “Very Good” category, indicating that the application has met the usability criteria.

## CONCLUSION

Based on the testing results and usability questionnaire distributed to teachers as users, the developed QR Code-based online attendance application has proven to have a good level of usability. From the questionnaire data processing, a total score of 855 was obtained, which was converted into 85.5%, indicating that the majority of users were satisfied with the performance and features of the application.

This testing shows that the main features of the application, such as user login, QR Code scanning for attendance, attendance data validation, and attendance report generation, run as expected and are easy for teachers to use. The attendance process, which was previously carried out manually or conventionally, can now be performed more quickly, efficiently, and accurately. This not only saves time but also reduces the risk of errors in recording attendance data.

In addition, the system makes it easier for admins to monitor user attendance in real time through dashboards and digital reports, thereby increasing transparency and attendance data management. Based on these results, it can be concluded that the QR Code-based attendance application is feasible for routine use in school or institutional administrative activities and is able to support operational efficiency and improve the accuracy of attendance recording. Overall, the development of this system provides added value for users and institutions

because it integrates modern technology into the attendance administration process, simplifies data management, and increases user satisfaction in carrying out attendance activities.

## ACKNOWLEDGMENT

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