Development of a Web-Mobile Based Attendance Information System For Teachers and Students Using QR Code Integrated With Geolocation

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Article Info	ABSTRACT
	This research aims to develop a web-based and mobile-based academic information system to simplify the process of recording student attendance at SMPN 33 Buton. The manual attendance system creates various obstacles such as delays in recording, data inaccuracy, and difficulties in monitoring. This system is designed using the Waterfall development method which includes the stages of needs analysis, design, implementation, testing, and deployment. Web technology is used for the admin and teacher dashboards, while mobile technology is used by students to record attendance. The system backend is supported by a structured database to ensure the efficiency and accuracy of data processing. The results of the development show that this system can simplify the process of recording student attendance and help the school in managing attendance data more effectively. *This is an open access article under the CC BY-SA license.*

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1. Introduction

The development of a web based and mobile attendance recording application at SMPN 33 Buton was motivated by the need for a reliable backup system when the primary system experiences problems. Currently, the school uses an RFID-based attendance system integrated with an attendance database. However, in practice, RFID devices do not always function optimally. Disruptions such as device damage, system errors, or network limitations can hinder the daily attendance process. Therefore, an alternative solution is needed that is flexible and remains integrated with the school's academic system, namely a web-based and mobile application. This application allows students to independently record attendance using digital devices, while teachers and school administrators can monitor and summarize attendance data online. [1]

If this backup application is not developed, then every time the RFID system experiences a disruption, student attendance recording will be disrupted, potentially leading to data inaccuracies. Schools may have to revert to manual recording methods, which are less efficient, prone to data loss, and complicate the reporting process. Irregularities in attendance recording can also affect student disciplinary assessments and hinder administration and monitoring processes that should be

automated. Therefore, the existence of this application is crucial for maintaining the continuity of the attendance system and supporting the overall digitalization process of schools. [2]
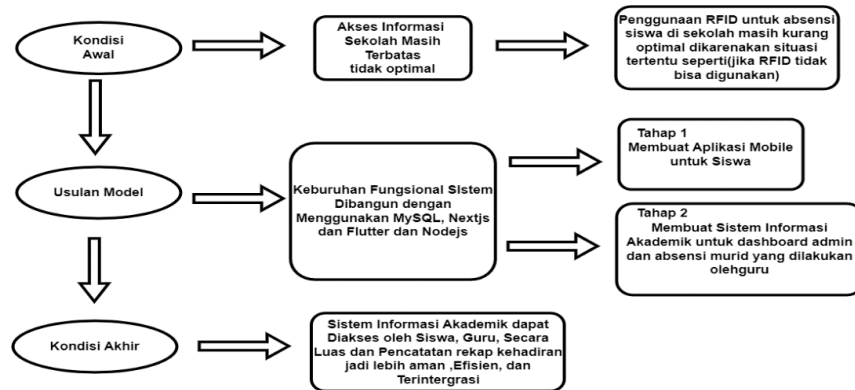
2. Research Method

2.1 Framework Study

Figure 1 Framework study

Framework study This explain channel development system start from stage identification need user, design proposed model, up to condition end in the form of implementation and evaluation service marketplace system worker let go. In the process of data collection, research use two source main [3] ,[4].

1) Firs, **the student and teacher list data** was obtained direct from SMPN 33 Buton through communication with party schools, in particular head school, as base need system information academic .[5]

2) Second, **the literature** that comes from from studies library about system information academics at school, which is used For strengthen runway theory, understanding relevant concepts, as well as support design of the proposed system model .[6]

2.2 Research Data

Study This use two main data sources, namely primary **data** obtained direct from SMPN 33 Buton through observation of the absence process, interviews with head school and staff related, and identification needs and constraints running system and **secondary data** originating from from literature, research previously, and reference about system information academic, website and mobile development, databases, and methods development device software. Data collection was carried out in stages on **June 6–14, 2025** For collect need users and references , then to be continued **June 16, 2025** with trial beginning system as base evaluation and improvement [7]
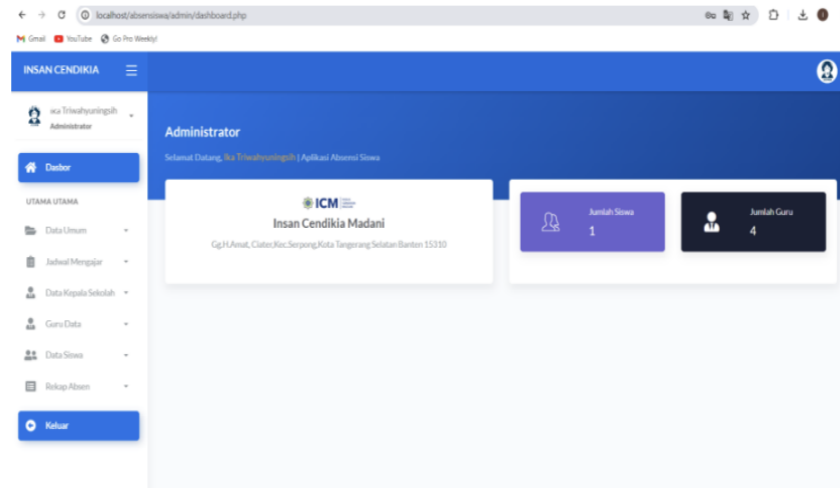

Figure 2 Student Data

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Figure 3. Journal References

2.3 Model Architecture

The proposed global system model architecture use approach **client-server** with **three-tier architecture** consisting of from layer Presentation, Logic Business, and Data [6]. In the **presentation layer**, the system provide interactive interface direct with users through two type application, namely application website based access via browser by school admin, teachers, and some parents, as well as application mobile based aimed at For students and parents so that they can access information attendance and academics with more easy through Android or iOS [8]devices. Next, on the **logic layer business**, all core processes of the system like validation, data processing and management transaction will run on the server using Language backend programming like Node.js with the Express framework. Layer This on duty processing request from the client, set channel logic system, communicating with the database, and return appropriate response to users [6].

2.4 Analysis and Design

Architecture proposed system implementing the client–server model with three-tier architecture approach, which divides system into three layer main, namely layer presentation, layers logic business, and data[9] layers. At the business layer presentation, system provide interface website based for admins, teachers, and some parents, while students and parents also get access through mobile application so that you can see information academic, attendance, and notifications in a way more practical and real-time. This interface design prioritizes convenience usability (user experience), responsiveness, and compatibility cross device so that capable support activity users from various condition network and device [10]

Next , the layer logic business implemented on the server using a Node.js backend with the Express framework. At this layer, all core system processes are executed. executed, including authentication and authorization users, data validation, processing request processing, orchestration functions academic like management grades, schedules, attendance, and mechanism delivery notification[11]. This layer also becomes bridging connector communication between interface users and databases through a structured API. The use of Node.js allows asynchronous and non-blocking execution, so that system capable handle Lots request in a way simultaneously and consistently guard performance tall [12]

Meanwhile, the data layer consists of from system database management that stores all over information academic, attendance students, user accounts, and activity logs. Communication between layer logic business and database are done through optimized queries For ensure speed data access and integrity. In addition , this layer is also equipped with with mechanism security like

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encryption, backup management, and control access based role based access control to maintain data confidentiality and reliability.

With structure these three layers, the system become more modular, easier developed, as well as can scaled in accordance need schools of the future. Architecture the allows every components good interface user, logic business, and databases are managed and updated in a way separated without bother part others. This is open opportunity development feature advanced like integration with system payment school, online learning platform, system assessment, as well as service academic others. With Thus, the system own flexibility tall For develop follow need operational school as well as support sustainable digital transformation.
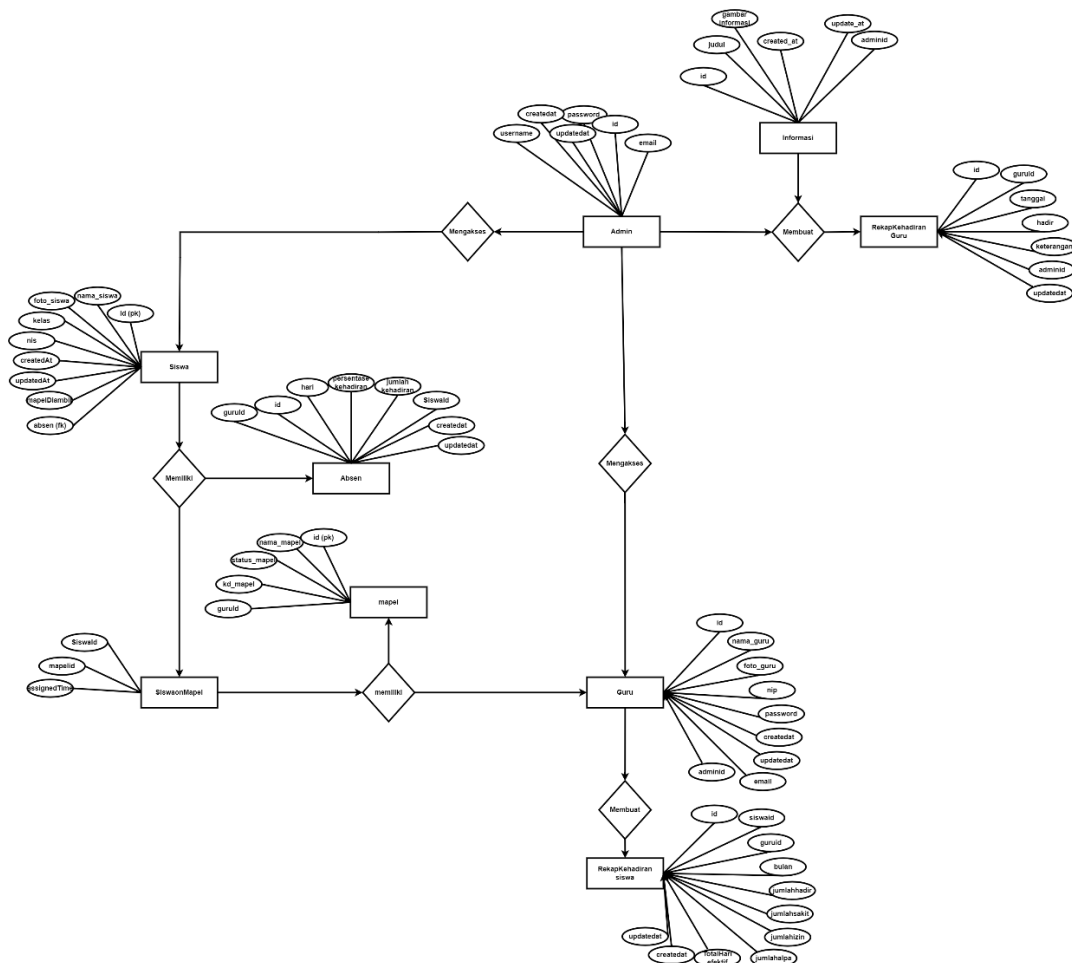

Figure 3. ERD

By structuring the system in this way, each layer can be developed, managed, and updated independently without disrupting other components. This modular design improves maintainability and reduces the risk of system-wide errors when modifications are required. Updates to the user interface, for instance, can be implemented without affecting database structures, while changes in business logic can be applied without interfering with data storage mechanisms. As a result, the system becomes easier to develop, test, and maintain, while also enabling efficient collaboration among development teams working on different layers.

Furthermore, the research emphasizes that this architectural approach provides high flexibility and scalability to support the future needs of educational institutions. As schools continue to adopt digital solutions, the system can be extended to integrate advanced features such as school payment systems, online learning platforms, academic assessment systems, and other supporting academic services. The three-layer architecture allows these features to be added incrementally without requiring a complete redesign of the system. This adaptability is essential for supporting sustainable digital transformation, as educational systems

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must continuously evolve in response to technological progress and changing operational requirements. Overall, the research highlights that a three-layer architecture serves not only as a technical framework but also as a long-term strategic foundation for reliable, flexible, and future-ready school information systems.
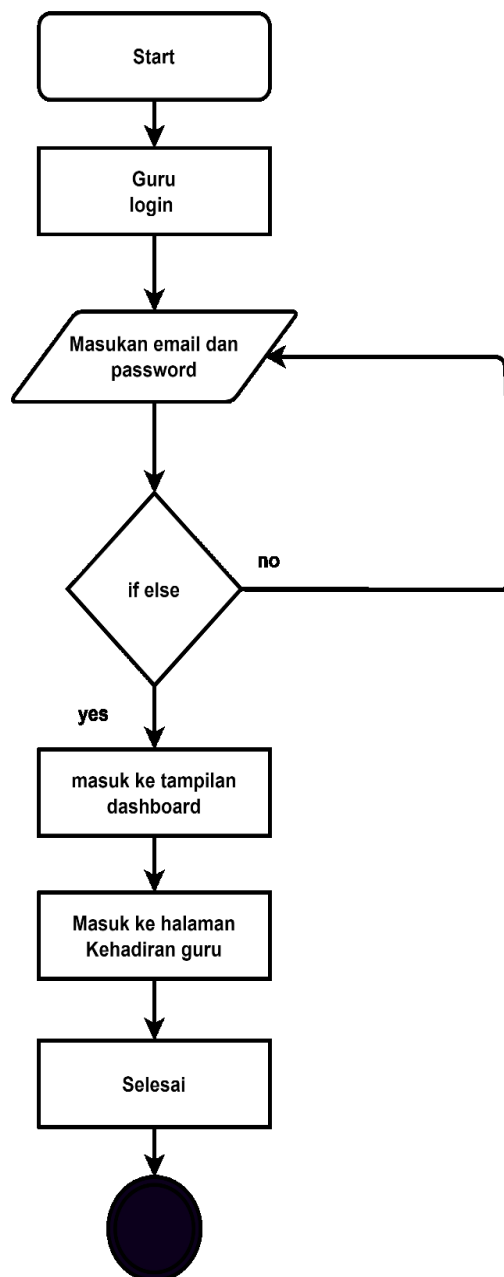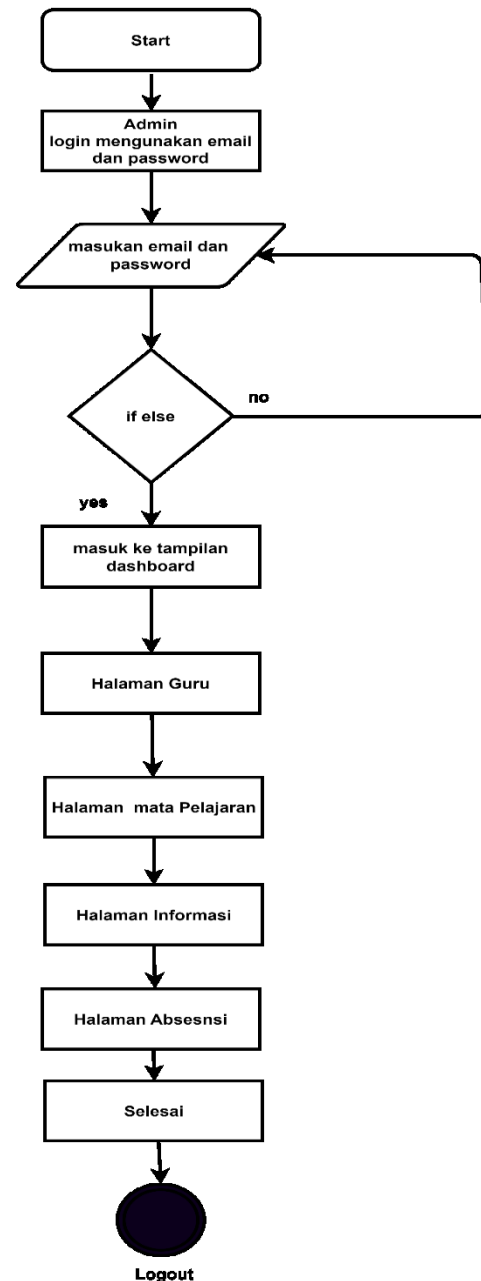

Figure 4 Teacher Flowchart

Figure 5 Admin Flowchart

3. Result and Discussion

Prototype application This system was developed as representation beginning from the system that will built in a way overall. Purpose manufacturing prototype is for give visual and functional image base from system to users and stakeholders, so that can done evaluation and improvement before development full to be continued [13].

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1. Student login page

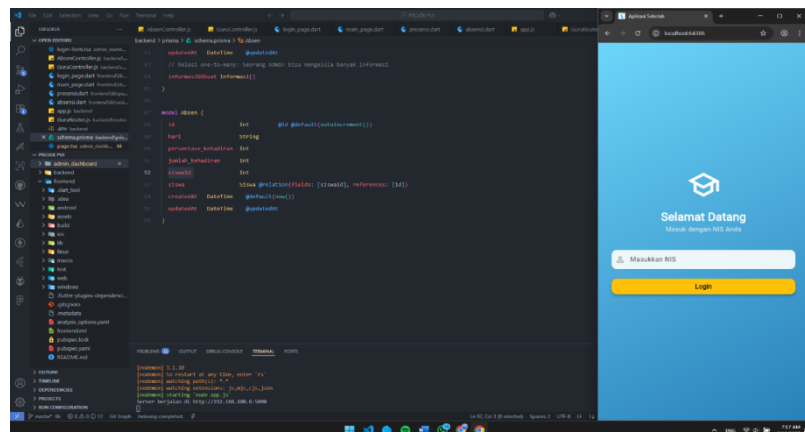On the page This student must login using number parent students who have registered.

Figure 4. 1Student Login Page

2. Home Page

On the page This If successful student login will directed to ho me page.
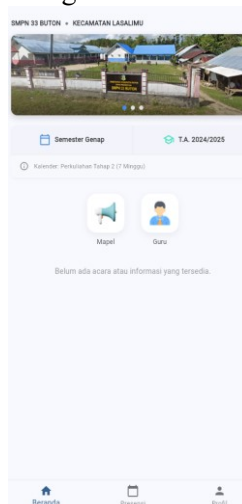

Figure 4. 2Home Page

3. Attendance Page

On the page This will display attendance list student If roll call always attendance and percentage more of 75 will give notification blue which means safe, if No he will colored red [14].
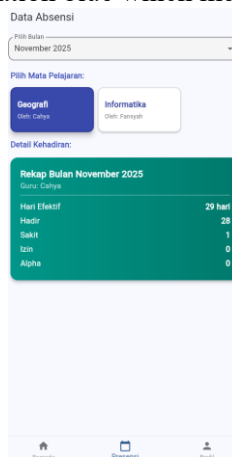

Figure 6 Attendance Page

4. Profile Page

On the page This will show profile students, where is the data? will consists of from Name student class and number parent student.
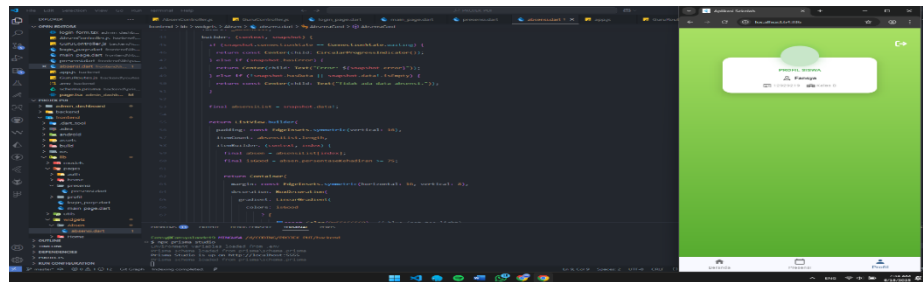

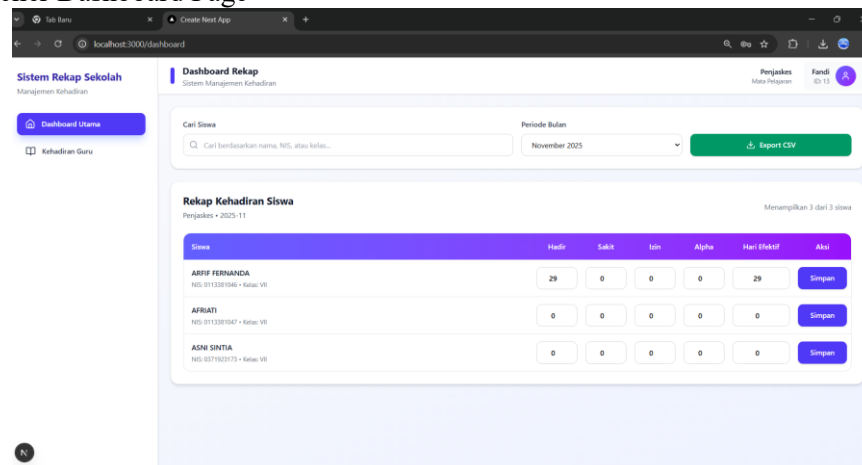*Figure 7 Profile Student*

5. Teacher Dashboard Page

Figure 8 Teacher Dashboard
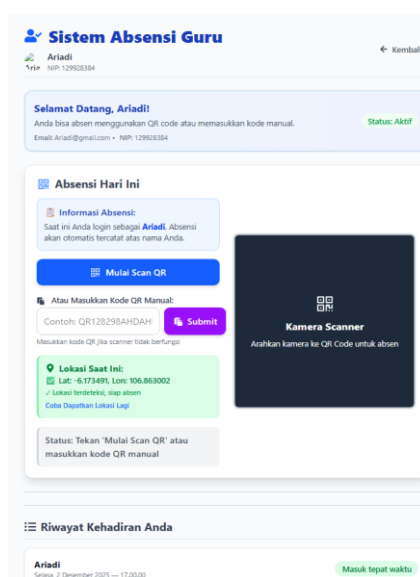
6. Teacher Attendance Page

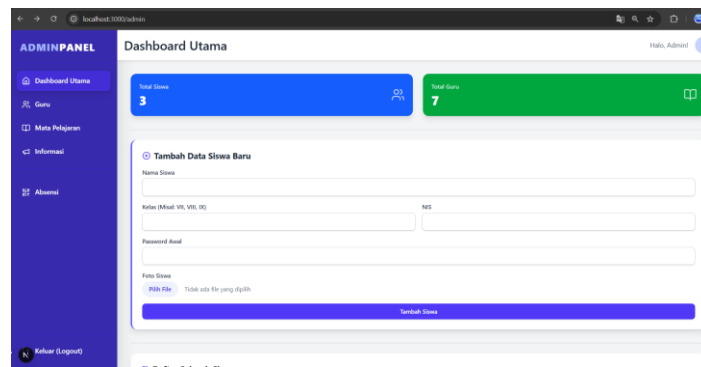Figure 9 Teacher Attendance Dashboard

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7. Admin Page

Figure 10 Admin Page
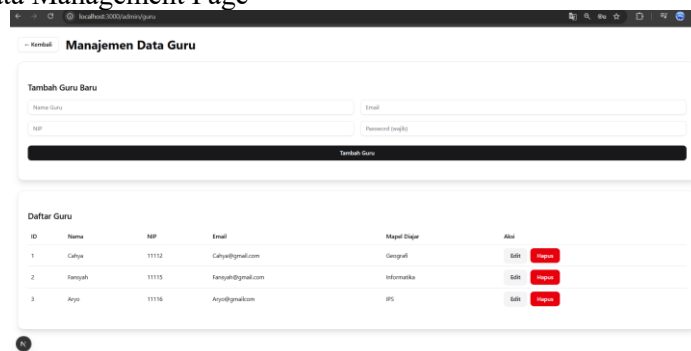
8. Teacher Data Management Page

Figure 11. Teacher data management page

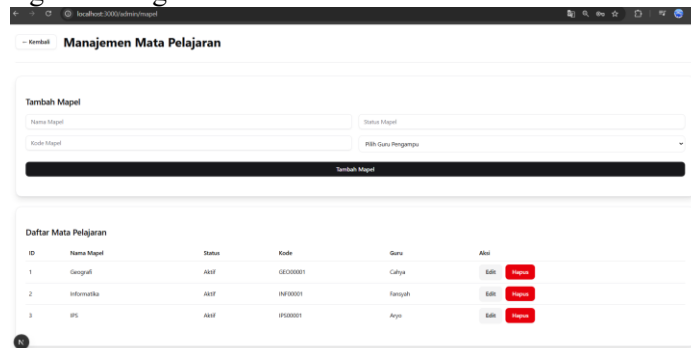9. Subject Management Page

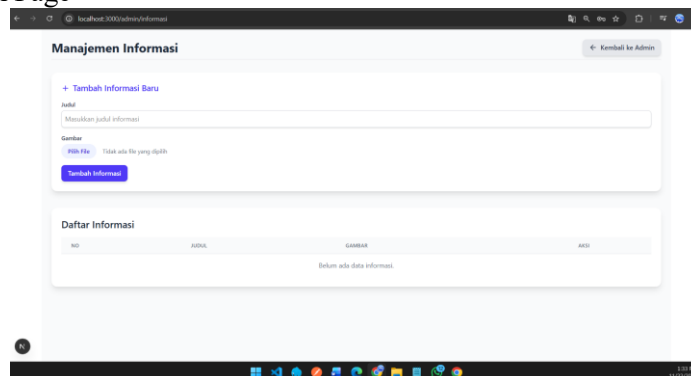Figure 12 Subject Page

10. Information Page

Figure 13 Information Page
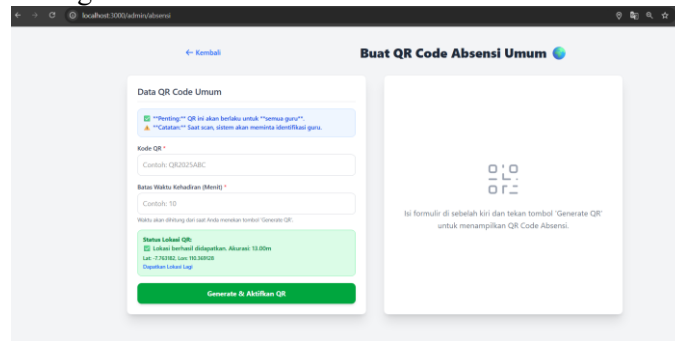
11. QR Attendance Page

Figure 14 QR Attendance Page

At the stage testing application , focus main directed at verification functionality data retrieval and display from the backend for ensure all over channel client–server communication is running as expected. Testing done with simulate various scenario use real, start from the login process, profile data request students, up to summons history absence daily. In normal conditions, application capable connected with the backend via REST API stable and consistent. Every requests sent by mobile applications such as student data request and attendance data can processed by the server and returned in form valid JSON response. The data Then displayed on the mobile interface without existence rendering errors, significant delays, or inconsistency information .[12]

The application also provides appropriate response to user input based on number parent students, with time fair processing so that show stable performance. Meanwhile that, in the condition abnormal, system capable handle various error without experienced a crash. When the connection to the backend is disturbed, the application display informative error messages such as "404" or "This site is No can reachable". Besides that, some feature like dashboard page on the website is known Not yet running. If the backend sends invalid response or corrupted data, application still stable and display message error or empty data as part from mechanism error handling, so that resilience application to disturbance can awake [15].

4.   Conclusion and Recommendation

The current project has successfully built a strong foundation of connectivity and data retrieval from the backend to basic frontend displays. However, a major limitation is the lack of a complete and functional *dashboard* or web interface for comprehensive data management and visualization. [16]. For my final project, I plan to expand and complement this system by building a comprehensive [17]*dashboard website* . This development will include:

1. Interactive User Interface: Design and implement an intuitive *user interface (UI) and* good *user experience (UX) for the dashboard* , enabling users (e.g., administrators) to easily view, search, filter, and manage data.
2. Full CRUD (Create, Read, Update, Delete) Features: Implement full functionality to add, read, modify, and delete data directly from *the dashboard* , interacting with existing backend APIs.
3. Authentication and Authorization System: Integrates *login system* and user role management to ensure only authorized users can access and modify data.

With this development, the Final Project will transform the project from a mere passive data display into a *fully functional* and interactive data management system. The proposed Final Project title is: "Design and Implementation of a Website and Mobile for an Academic Information System with School Data Management Features at SMPN 33 BUTON"

Based on results development and testing application , it is recommended that this system be continued with focus on building a more web dashboard complete and functional . The dashboard should equipped with interactive and easy interface used , so that the administrator can do data management effective through feature improved search , filtering , and navigation . In addition , the

development integrated CRUD features with backend API is very important For allows data management direct via web platform. System authentication and authorization based role is also necessary implemented use ensure data security and protection , as well as limit access only to the authorities . With this development , the system will develop from just presenter information to be a comprehensive , adaptive , and ready data management platform used as supporters activity academic at SMPN 33 Buton .

Acknowledgement

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