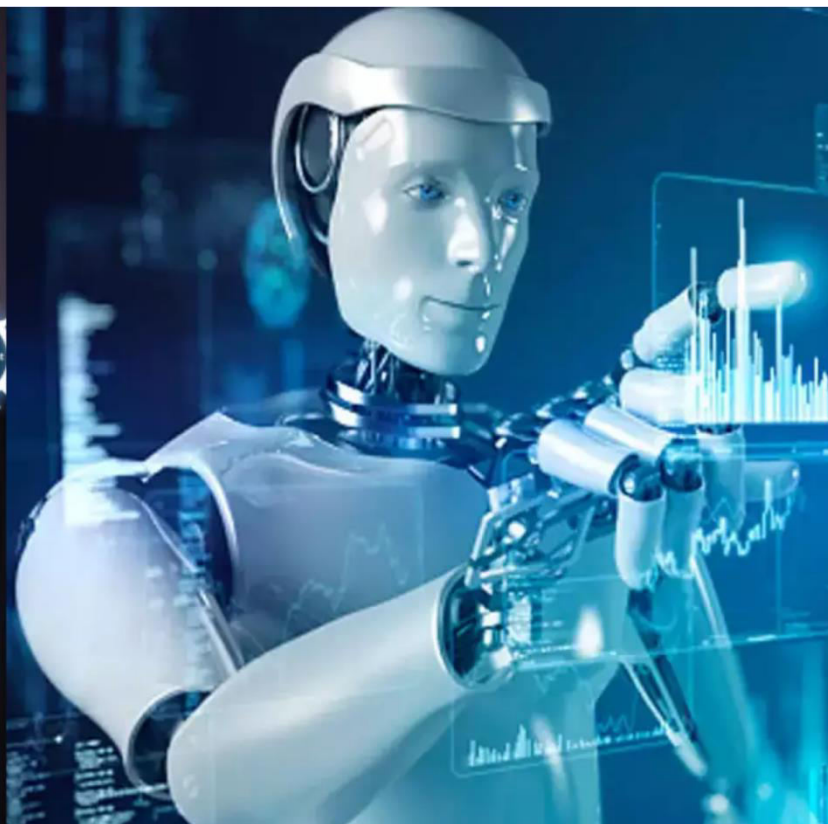




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Design and Development of a Student Attendance Management System using Flutter and Supabase

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ABSTRACT: In the contemporary educational environment, the manual process of maintaining student attendance records has become increasingly inefficient, vulnerable to human error, and administratively cumbersome. To mitigate these challenges, this paper presents the design and implementation of an automated student attendance management system using Flutter and Supabase as backend infrastructure for cross-platform application development. The proposed system leverages modern cloud-based technologies to ensure secure, scalable and real-time management of attendance data across various educational institutions.

The system architecture is designed to provide an intuitive interface for teachers to record attendance efficiently, while the integration of Supabase facilitates strong user authentication, seamless synchronization, and real-time database operations. The application supports distinct user hierarchies—administrators, faculty members, and students—thereby promoting transparency and access control. Additionally, the system enables analytical insights through attendance visualization and report generation, enhancing institutional decision making and student performance tracking.

Empirical evaluation shows that the proposed solution clearly reduces data redundancy, reduces manual intervention, and improves the overall reliability of attendance management processes. By utilizing the combined capabilities of Flutter's responsive UI framework and Supabase's serverless backend services, the system provides an effective, scalable, and platform-independent solution to traditional attendance monitoring methods.

KEYWORDS: Student Attendance Management, Flutter Framework, Supabase, Cloud Integration, Real-Time Database, Automation, Educational Technology.

I. INTRODUCTION

Attendance management is a fundamental aspect of academic institutions and serves as a key indicator of student participation, discipline, and overall commitment to the learning process. Traditionally, attendance tracking has been done manually through logs or spreadsheets, which is not only time-consuming but also vulnerable to human error, data duplication, and inefficiencies in record retrieval. As educational environments continue to evolve in the digital age, there is a growing need to adopt technological solutions that can automate and improve the accuracy of such administrative processes.

With the rapid advancement of mobile computing and cloud technologies, modern institutions are increasingly adopting digital systems to manage attendance data. The proposed system uses Flutter, a robust cross-platform framework developed by Google, to deliver a responsive, high-performance and visually consistent mobile application. Complementing this, Supabase, an open source backend platform as a service, provides essential server-side

functionality including real-time database synchronization, secure user authentication, and cloud-based data storage. Together, these technologies facilitate the development of a scalable and efficient system capable of automating attendance management tasks across different platforms with minimal overhead.

Existing manual and semi-digital systems often do not offer features such as real-time data access, instant reporting, or reliable synchronization between devices. Additionally, proprietary assistance systems are often expensive or limited in terms of flexibility and customization. On the contrary, the system proposed in this research aims to overcome these limitations by offering an open source cloud.

II. LITERATURE SURVEY

Many researchers have explored the automation of attendance management systems to overcome the inefficiencies of manual recordkeeping. Traditional paper-based and spreadsheet-based methods often result in errors, data duplication, and difficulty in long-term analysis. Early digital systems using desktop applications and relational databases such as MySQL improved data storage but lacked portability and real-time access.

Web-based solutions later emerged, offering centralized data access through browsers. Although these systems provided better flexibility, they still suffered from limitations such as latency, maintenance complexity, and poor adaptability to mobile platforms. With the increasing use of smartphones, mobile-based systems built on Android and Firebase have gained popularity for their real-time synchronization and ease of use. However, most relied on subscription-based or closed-source services, which limited customization and increased costs.

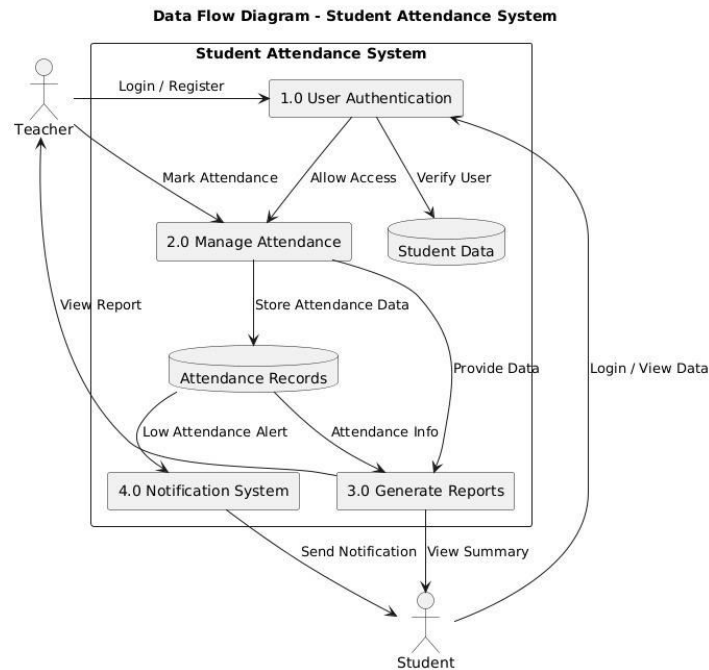
Some recent studies have implemented RFID and biometric-based attendance tracking to higher accuracy, but these systems require expensive hardware and infrastructure, making them less viable for many institutions. The proposed system addresses these gaps by integrating Flutter and Supabase as an open-source backend solution for cross-platform development. This combination ensures real-time data synchronization, secure authentication, and cost-effective scalability while maintaining institutional control over data. This approach thus increases accessibility, transparency and efficiency compared to traditional and proprietary alternatives.

III. METHODOLOGY

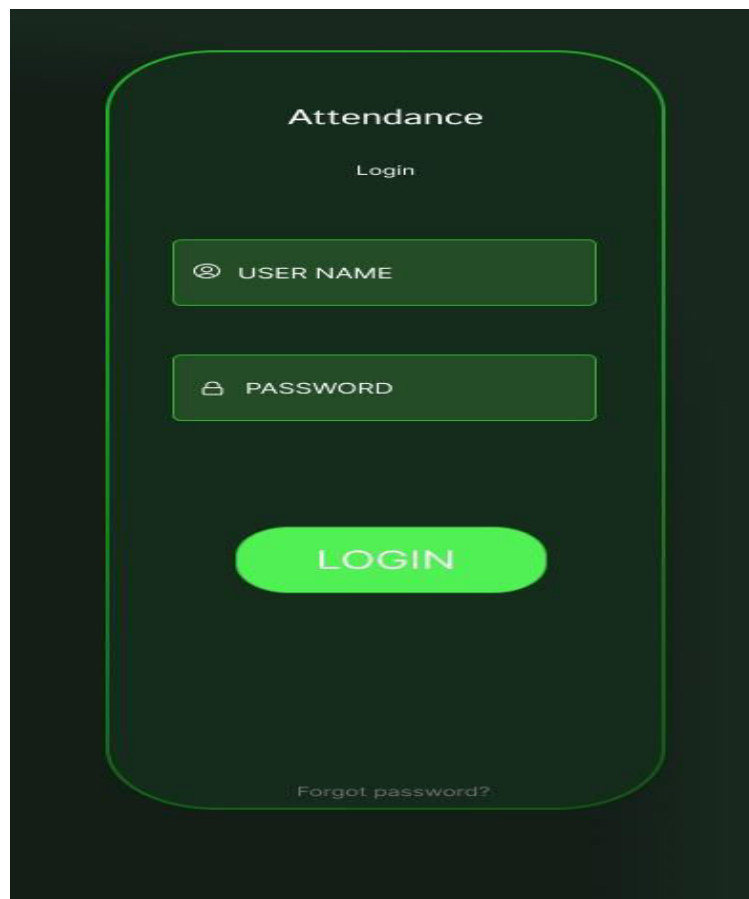
The development of student attendance management system follows a structured and modular methodology to ensure reliability, scalability and efficiency. The system is designed using Flutter as the front-end framework and Supabase as the backend platform. The overall architecture adopts a client-server model, where the Flutter application acts as the client interface and Supabase handles data storage, authentication, and synchronization in the cloud.

The methodology begins with the system design phase, where requirements were analyzed to identify essential features such as attendance marking, user authentication, data retrieval and reporting. The user interface was developed using Flutter's widget-based architecture to ensure smooth navigation, responsive layout, and cross-platform compatibility. Supabase was integrated using its API services to provide secure login, real-time database updates, and role-based access controls for administrators, teachers, and students.

During implementation, the application's modules were divided into functional components, including the authentication module, which verifies user credentials; Attendance module, which allows teachers to record attendance efficiently; and the database module, which manages secure data storage and synchronization. A reporting module was also developed to generate attendance summaries and insights for academic assessment.



IV. EXPECTED RESULTS



Attendance

Login

[Forgot password?](#)

V. CONCLUSION

This project delivers a practical, low-cost attendance solution by coupling a Flutter-based client with a Supabase backend. The resulting application streamlines recordkeeping through instantaneous data updates, role-specific access, and straightforward reporting, which together cut down administrative effort and reduce manual errors. The modular implementation makes the system easy to maintain and scale for institutions of varying sizes.

Looking ahead, the platform can be extended with stronger identity verification (for example, biometric or vision-based checks) and with analytics modules that surface attendance trends and at-risk patterns. Such enhancements would increase automation and provide more actionable insights for educators and administrators. Overall, the work demonstrates a viable, maintainable pathway for moving routine academic administration from paper and spreadsheets into a lightweight, cloud-enabled workflow.

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