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Abstract: *This paper presents the development of AttendEase, a geolocation-based mobile application designed to improve attendance management at the Bureau of Internal Revenue, Butuan City. The agency's existing biometric system frequently experiences fingerprint recognition errors and inefficiencies, prompting the need for a more reliable and user-friendly solution. Traditional attendance tracking methods—ranging from manual logs to RFID and biometric systems—have shown limitations in accuracy, security, and adaptability, particularly in government and institutional settings. AttendEase leverages geofencing technology to allow employees to log attendance only within a defined proximity to the office, enhancing the integrity and security of time tracking. The system includes core features such as real-time attendance status, leave request submission, and pass slip processing. A usability evaluation was conducted using the System Usability Scale (SUS) which yielded an average score of 80.74—indicating high user satisfaction and effectiveness. These results demonstrate that geolocation-based attendance systems can significantly streamline administrative workflows, reduce errors, and improve accountability in public sector environments.*

Keywords: attendance; geofencing; mobile application; employee attendance management, react native

1. INTRODUCTION

Attendance management in a work setting is the process of monitoring, recording, and managing employee time off, attendance, and presence. It includes scheduling work, taking time off, processing leave, and other activities that align with employee time and work. Accurate and efficient attendance management is very important because it helps identify the true cost of employees and plan workload. It helps comply with labor laws and policies. It provides clear records for payroll and benefits. It restores discipline and productivity in the workforce and avoids issues of cheating or suspicious work time. Generally, good attendance management is the foundation of an organization's success and integrity.

Traditionally, attendance systems fall into two categories: manual and automated. Manual systems involve handwritten logs or spreadsheets—methods prone to errors and manipulation. Even biometric systems, while offering a higher degree of automation, suffer from recognition failures and cannot always account for employee presence accurately. One published study identified the challenges in such systems, particularly in time theft and biometric inefficiencies [1].

In response to these limitations, researchers have introduced automated location-based attendance systems. For instance, [2] one study developed a GPS-based attendance application for business use. However, it faced issues in signal reliability. RFID and NFC-based systems, offer proxy prevention but often require expensive infrastructure [3]. Several studies combined GPS with biometric recognition in a hybrid model, but the system's complexity and cost make it less suitable for widespread use [4], [5].

Recently, geofencing has emerged as a reliable solution. It allows applications to define virtual boundaries and trigger actions when users enter or exit a specific area. Existing studies have demonstrated that certain systems are effective in recognizing physical presence, thus reducing the need for human interventions and providing attendance records. [2], [6]. An additional innovation was presented in a separate study, which devised a smart university system that utilizes Internet of Things (IoT) technology and geolocation for real-time monitoring. [7]. Nevertheless, numerous current systems continue to encounter challenges, as they often exhibit excessive complexity, high costs, or insufficient real-time functionalities. This highlights the necessity for a more efficient, economically viable, and user-centric solution.[3].

In Butuan City, the Bureau of Internal Revenue (BIR) has consistently employed a biometric attendance system for monitoring employee time. However, this system has encountered ongoing challenges, including recurrent fingerprint recognition errors, prolonged processing durations, and inaccuracies in the logging of attendance. These complications have led to administrative delays, erroneous time records, and a deficiency in transparency regarding employee attendance data.

This research presents AttendEase, a mobile application utilizing geolocation technology to enhance attendance management via geofencing. Employees are permitted to log their attendance exclusively when present within a specified virtual perimeter surrounding the office, thereby significantly improving both accuracy and security. Additionally, the application incorporates essential functionalities such as real-time updates on attendance status, leave request submission, and approval

of pass slips, thereby facilitating smoother interactions between employees and administrative personnel.

This paper describes the development process, implementation details, and evaluation results regarding the system's usability [8]. By doing so, AttendEase plays a significant role in modernizing government operations, providing a scalable and efficient solution for government bodies looking to enhance attendance management and administrative efficiency. The achievements of this system could potentially serve as a blueprint for future digital transformation efforts within the public sector.

2. METHODOLOGY

The process of achieving the objective of the study starts with defining the system requirement. Part of the process was identifying the different entities and the interaction of the system components – mobile users, web users, backend server, development tools, software and hardware requirements, geofencing mechanism and related security requirements.

- Employees (Mobile Users): Use the mobile application to log their attendance (Time In, Break In, Break Out, and Time Out). Logging is only enabled when users are within the geofenced location of the BIR office.
- Admin (Web User): Accesses the admin panel to manage employees, leave request management, pass slip validations, and monitor real-time attendance logs and statistics.
- Geofencing Mechanism: Ensures that attendance actions are validated based on the employee's proximity to the predefined office coordinates, thus eliminating fraudulent or off-site logging.
- Backend Server: Developed with Laravel, it handles user authentication, API communication, attendance recording, leave/pass slip requests, and stores the data in a MySQL database.

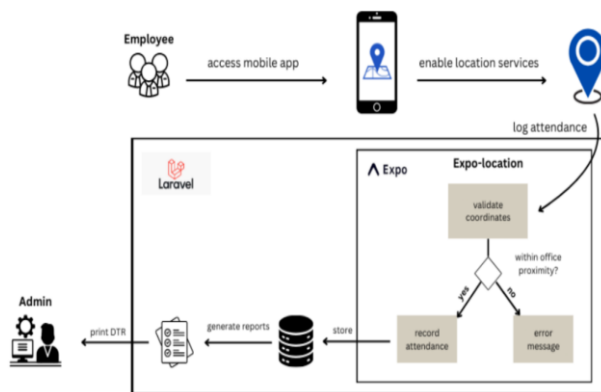


Fig. 1 Conceptual Framework of the Study

This framework (Fig. 1) demonstrates how the integration of modern technologies improves attendance management by increasing accuracy, reducing administrative workload, and enhancing operational transparency within government institutions.

2.2 Agile Methodology

To guide the development of AttendEase, the Agile methodology was adopted due to its iterative and adaptive nature. Agile promotes continuous

collaboration between developers and stakeholders, enabling timely feedback and incremental improvements throughout the development cycle. The process was organized into several distinct phases: data gathering, planning, design, development, and testing and evaluation.

2.3 System Requirements

This section outlines the hardware and software requirements necessary for the development, deployment, and use of the AttendEase system.

Table. 1 Software and Hardware requirements

Platform	Minmum Requirements
Mobile App	• Android 10 or higher, 4 GB RAM, 64 GB Storage • Adroid 10 or later • Location Services (GPS-enabled)
Admin Panel	• Intel Core i3 (or equivalent), 4 GB RAM (8 GB preferred), 128 GB Storage • Windows 10 or later • Latest versions of Chrome, Firefox, or Edge

The system requirements (Table. 1) for AttendEase ensure smooth performance for both users and developers. Mobile users need devices with Android 10 or higher and sufficient memory and storage, while the admin panel requires a modern PC with a mid-range processor and adequate RAM. Developers should use higher-spec machines to efficiently handle development tools, simulators, and testing.

Table. 2 System Functionality-User Matrix

System Functions	Employee (Mobile App)	Admin (HR)
Apply for Leave	✓	✓
Apply for Pass Slip	✓	✓
Break In	✓	✓
Break Out	✓	✓
Login	✓	✓
Logout	✓	✓
Manage Leave Requests	✗	✓
Manage Employee Accounts	✗	✓
Manage Pass Slips	✗	✓
Monitor Logs	✗	✓
Print DTR	✗	✓
Register	✓	✓
Time In	✓	✓
Time Out	✓	✓
Update Profile Details	✓	✓
View Attendance History	✓	✓
View Daily Attendance Breakdown	✗	✓
View Daily Attendance Summary	✗	✓
View Leave History	✗	✓
View Monthly Attendance Breakdown	✗	✓
View Pass Slip History	✗	✓
View Recent Time in Logs	✗	✓

Table. 2 presents a structured overview of the system functionalities available to each user role within the AttendEase system. The interactions have been organized into a tabular format for clarity and ease of comparison. The table lists all major features of the system in the first column, with corresponding access indicators for User 1 (Employee) and User 2 (Admin) in the second and third columns, respectively.

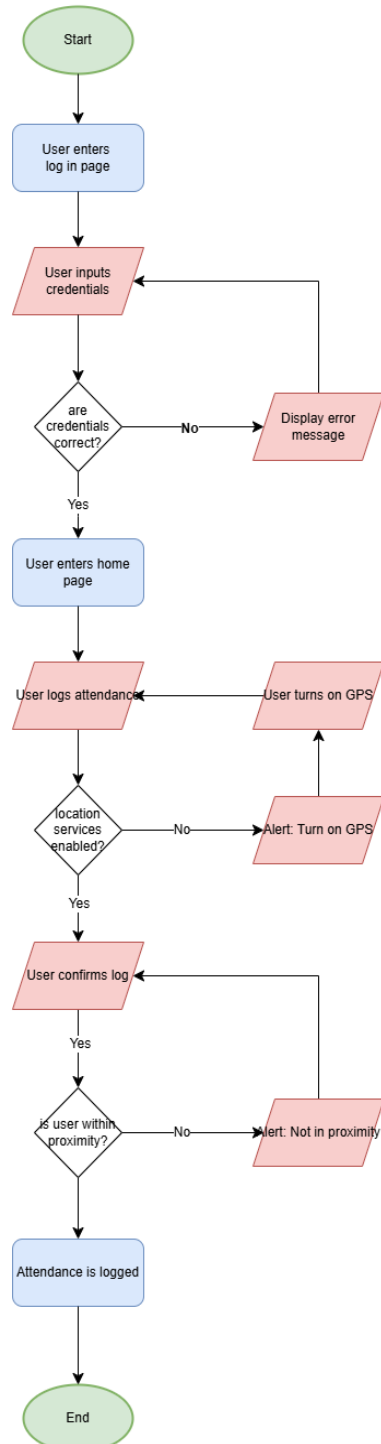


Fig. 2 System Flowchart

The flowchart *Fig. 2* above illustrates the process of logging attendance through the mobile application. It starts with the user logging in and verifying their credentials. Upon successful login, the user logs attendance by tapping the log button. The system then checks if location services are enabled and prompts the

user to turn on GPS if it is disabled. Once GPS is active, the app verifies if the user is within the allowed geofenced area. If confirmed, the attendance is successfully recorded; otherwise, an alert is shown indicating the user is out of range.

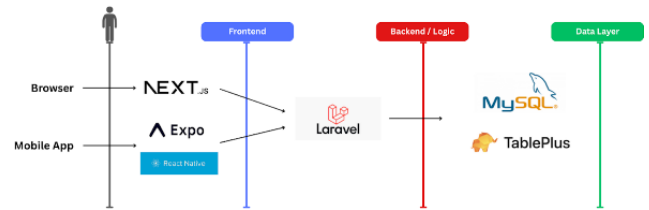


Fig. 3 System Architecture

The system architecture *Fig. 3* follows a layered design, starting with the Frontend, which supports both web and mobile platforms using Next.js for browser access and React Native with Expo for mobile applications. These interfaces communicate with the Backend, powered by Laravel, which handles the core application logic and processing. The backend then connects to the Data Layer, where MySQL serves as the primary database and TablePlus is used for database management. This setup ensures modular development, efficient data handling, and a smooth user experience across platforms.

A relational database design approach will be employed for the system. Relational databases are chosen for their powerful data consistency, integrity, and transactional support, all of which are crucial for applications where data accuracy is paramount. Relational databases offer structured data storage as well, making it easier to execute complex queries and establish relationships between different entities within the system.

2.4 Deployment and Usability Evaluation

For the purpose of testing and demonstration, the mobile application was accessed using the Expo Go application, which is available on the Google Play Store. By utilizing the Expo's development environment, to loading the project made easy through a QR code generated from the local codebase. This approach allowed for real-time testing on physical mobile devices without the need for building and installing APK files.

The System Usability Scale (SUS) [9] test was conducted among 27 employees from the Administrative and Human Resources Management Division of the Bureau of Internal Revenue – Revenue Region No. 17, Butuan City. The participants included 10 males and 17 females, representing the target users of the system.

3. RESULTS AND DISCUSSION

The developed system – AttendEase, was designed to address the attendance monitoring challenges faced by the BIR–Butuan City. The system integrates real-time status monitoring and essential administrative functions to streamline attendance tracking and related processes.

The mobile application allows employees to log their attendance using geolocation-based validation, ensuring that logs are recorded only when users are within the defined proximity of the office location. Additionally, the system supports real-time status monitoring, providing

both employees and administrators with up-to-date attendance statuses such as Time In, Break In Break Out, and Time Out.

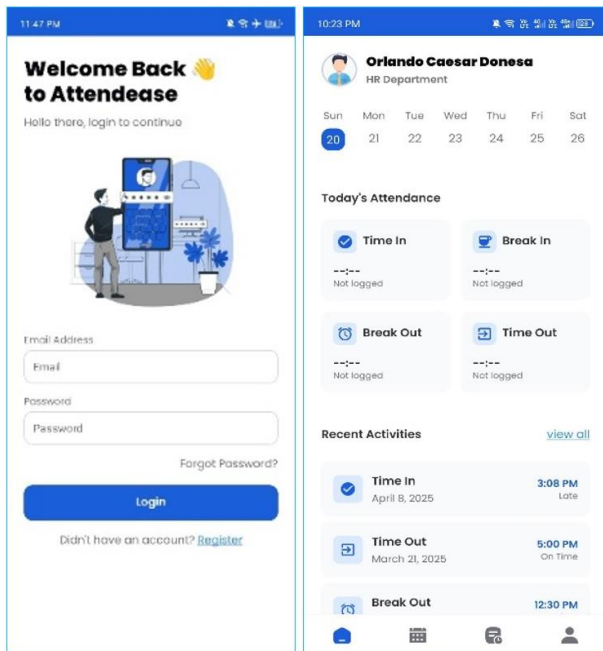


Fig. 4 Employees dashboard using Mobile app.

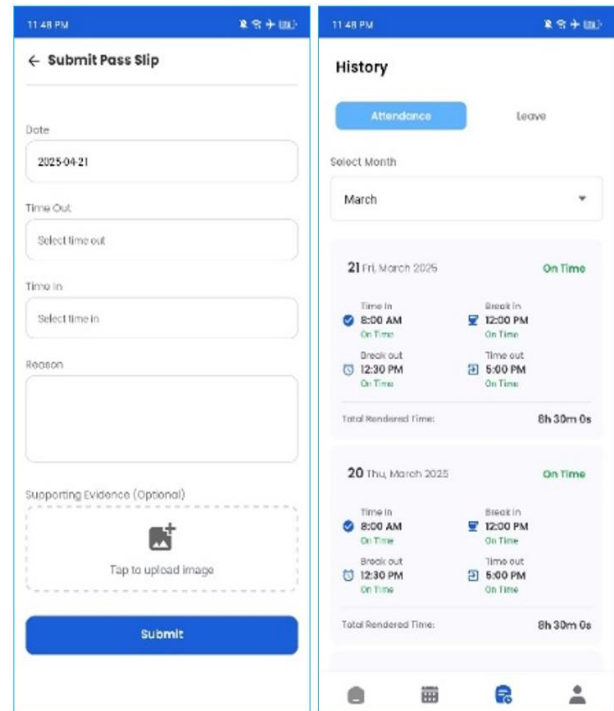


Fig. 6 Leave Request and log history mobile interface.

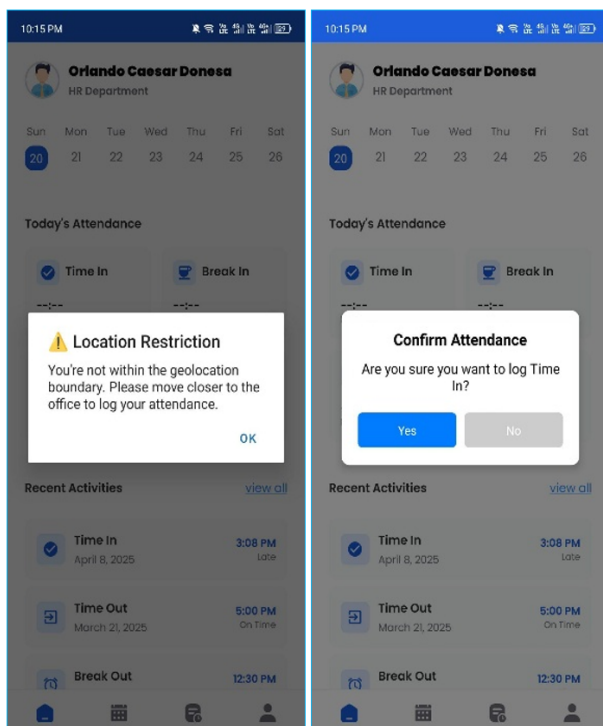


Fig. 5 Location-based attendance logging.

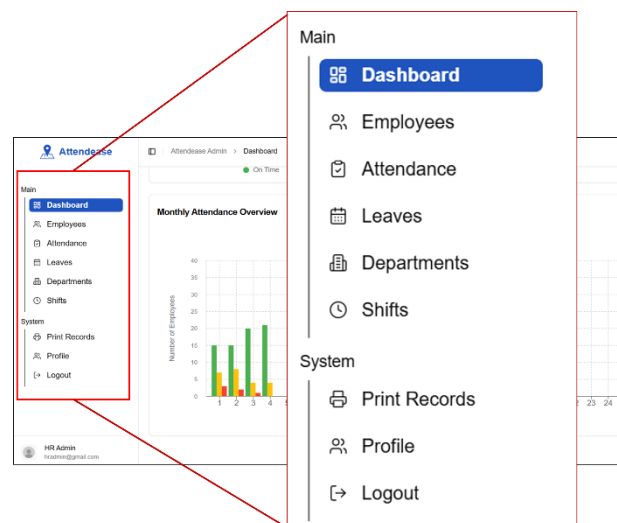


Fig. 7 Admin Panel Menu

Beyond attendance logging, AttendEase incorporates administrative features that extend its functionality:

- **Leave Request Management:** Employees can submit leave requests through the mobile app, which are then reviewed and approved or rejected by authorized administrators.
- **Pass Slip Approvals:** The system also supports the submission and approval of pass slips, enabling employees to request permission for short-term official absences during working hours.

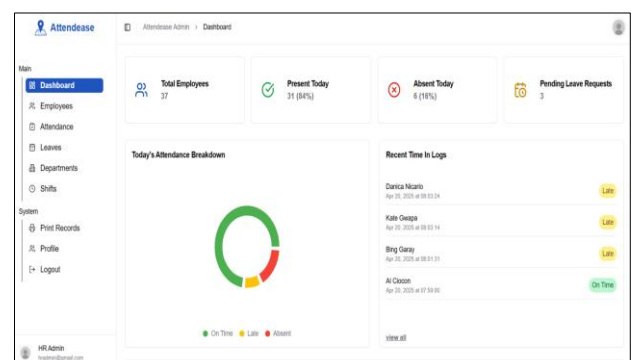


Fig. 8 Admin Dashboard

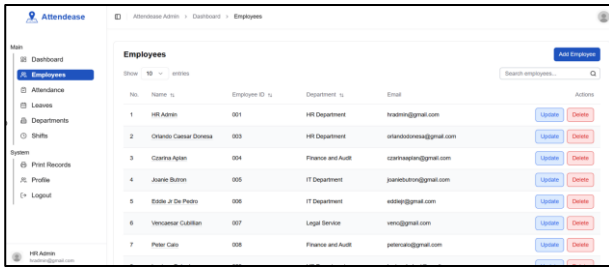


Fig. 9 Employee Attendance Monitoring Dashboard.

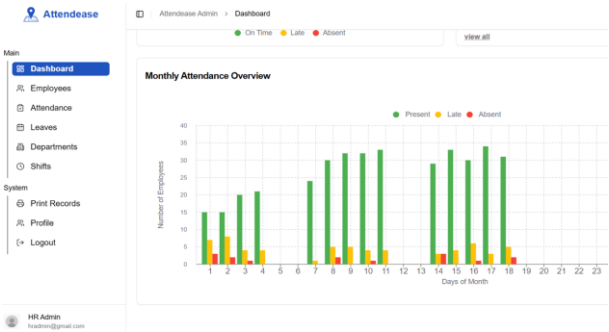


Fig. 10 Graphical Attendance reports

Civil Service Form no. 48

DAILY TIME RECORD

Orlando Caesar Donesa
(Name)

For the month of March, 2025

Official hours of arrival and departure: _____ Regular Days: _____ Saturdays: _____

Days	A.M.		P.M.		Under Time	
	Arrival	Departure	Arrival	Departure	Hours	Minutes
1						
2						
3	08:00	12:00	12:30	17:00	9	00
4	08:00	12:00	12:30	17:00	9	00
5	08:00	12:00	12:30	17:00	9	00
6	08:00	12:00	12:30	17:00	9	00
7	08:00	12:00	12:30	17:00	9	00
8						
9						
10	08:00	12:00	12:30	17:00	9	00
11	08:00	12:00	12:30	17:00	9	00
12	08:00	12:00	12:30	17:00	9	00
13	08:00	12:00	12:30	17:00	9	00
14	08:00	12:00	12:30	17:00	9	00
15						
16						
17		12:00	12:30	17:00	9	00
18	08:00	12:00	12:30	17:00	9	00
19	08:00	12:00	12:30	17:00	9	00

Fig. 11 Generated Daily Time Record (DTR)

3.2 Geofencing

Geofencing is an important feature in the AttendEase mobile app that helps log attendance accurately by checking how close someone is to the organization's building. The system has a geofence set up with a 40-meter radius around the office location. When an employee tries to clock in, the app checks whether their device is within that area. If users are inside the geofence, attendance gets recorded, confirming they're within the perimeter.

3.3 System Usability Evaluation Result

The usability of the application was evaluated using the standard System Usability Scale (SUS). Evaluators comprise 27 HR department employees and

administrators. The standard SUS includes 10 items rated on a five-point Likert scale (1-Strongly Disagree, 5-Strongly Agree). The items focused on evaluating efficiency in recording attendance log and ease of use. A significant part of the evaluation process is the rating of how the system will handle multiple attendance recording.

Fig. 12 displays the average scores for each of the ten surveyed items.

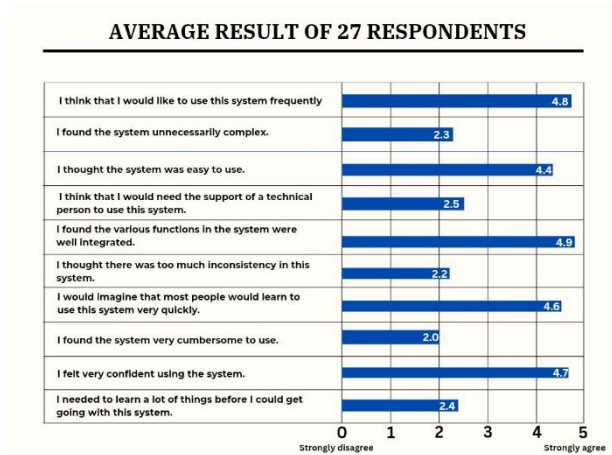


Fig. 12 SUS Evaluation Response

The user evaluation of AttendEase revealed high satisfaction, with a SUS score of 80.74, exceeding the benchmark of 68 and placing it in the "Excellent" range (Grade A). This confirms that the system is intuitive, easy to use, and ready for implementation at BIR – Butuan.

Table. 3 System Usability Evaluation Results

Metric	Value
Number of Participants	27
Average SUS Score	80.74
Usability Grade	A
Adjective Rating	Excellent

4. SUMMARY, CONCLUSION AND RECOMMENDATION

This study centered on creating and rolling out AttendEase, a mobile application designed for managing attendance through geolocation. The main goal of this project was to tackle typical problems associated with the Bureau's current biometric attendance system, which included issues like fingerprint recognition errors, inefficiencies in manual logging, system unreliability, and time theft.

AttendEase employs geofencing technology, allowing employees to clock in and out only when they're within a set office boundary. It was built using React Native for the mobile app and Laravel for the web-based admin interface, with MySQL serving as the database. Some of the notable features are real-time status updates, location-based attendance verification, and automated attendance reporting.

The development process followed Agile methodologies, and the system underwent rigorous testing based on specific test cases. These tests verified

that the system operated correctly in various scenarios, such as checking in within the geofence, accommodating multiple users, and generating attendance reports. Additionally, a System Usability Scale (SUS) evaluation conducted with 27 participants resulted in an impressive average score of 80.74, which reflects excellent usability and a strong level of user satisfaction.

4.1 CONCLUSION

The creation of AttendEase has effectively met the essential requirement for a streamlined, secure, and user-centric approach to attendance monitoring. This initiative examined the drawbacks of conventional attendance methodologies—such as manual roll calls and the usage of spreadsheets for tracking—and illustrated how contemporary technological advancements, especially biometric and online solutions, can greatly enhance accuracy, minimize human error, and conserve time.

Through meticulous evaluation, design, execution, and assessment, the system successfully achieved its primary goals: automating the collection of attendance, improving accessibility for users (both administrators and employees), and offering real-time data management and reporting capabilities. The incorporation of secure login protocols, a well-organized database, and a user-friendly interface significantly enhanced the system's reliability and usability.

This initiative also underscored the significance of implementing scalable and sustainable solutions, indicating that AttendEase has the potential to be integrated with various institutional systems in the future. Furthermore, by accentuating the opportunities for data analytics and reporting within the system, it sets the foundation for future advancements, including predictive attendance monitoring and correlations with academic performance. In summary, the system represents a substantial leap forward in the digital transformation of administrative functions in academia and exemplifies how technology can be utilized to optimize operations, enhance accuracy, and facilitate improved decision-making.

4.2 RECOMMENDATION

In light of the system's performance and user feedback, the following recommendations are proposed:

- Offline mode for attendance logging
- Enhanced geolocation accuracy.
- Biometric authentication integration.
- Push notifications for attendance reminders.
- Increase system evaluation participants

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