Digital Attendance System with Location Tracking and Selfie Verification for Employee Presence Monitoring at PT Fazana Berkah Mulia

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Abstract

This research develops a web-based digital attendance system for PT. Fazana Berkah Mulia to overcome weaknesses in manual attendance, namely the possibility of attendance manipulation, slow recap, and limited monitoring. The system integrates GPS-based geofencing and selfie photo capture so that every check-in and check-out is validated by user identity and by location inside a predefined radius. Development adopts the Extreme Programming (XP) methodology, which allows short iterations and continuous user feedback. The application was implemented using PHP, MySQL, and Leaflet.js to display employee and office coordinates on an interactive map. Functional testing with a black-box approach showed that authentication, attendance recording, geolocation validation, and report generation worked according to the specified requirements. The proposed system therefore provides more accurate, secure, and real-time attendance data to support HR decision making.

1. Introduction

The rapid growth of information technology has encouraged organizations to digitize their operational processes, including human resource management. Attendance recording is one of the most crucial activities because it is directly related to employee discipline, payroll accuracy, and managerial transparency. However, many companies in Indonesia still rely on manual or semi-manual attendance, which leads to problems such as data manipulation, slow recap, and difficulty monitoring attendance in real time. PT. Fazana Berkah Mulia experiences the same limitations, especially the absence of location validation when employees submit their attendance. Similar studies on web-based HR information systems also emphasize that digitization helps improve data accuracy and speeds up administrative processing in HR divisions (Indah Adinda Marleni & Aris Gunaryati, 2023), so the issue faced by PT. Fazana Berkah Mulia is consistent with a broader organizational need to modernize attendance management.

To address these issues, this research proposes a web-based digital attendance system that integrates GPS-based location tracking and selfie photo verification. With this mechanism, every check-in and check-out is not only time-stamped but also validated by the user's geographical position within a predefined office radius and

by the employee's identity, thereby reducing the possibility of proxy attendance. This approach follows previous implementations of web attendance with GPS validation, which have proven effective in preventing attendance fraud and ensuring that employees are truly at the permitted workplace when submitting their presence (Aryanti & Karmila, 2022). The system also provides daily and monthly attendance reports so that the HR/admin division can access data faster and in a more structured format.

The development process adopts the Extreme Programming (XP) methodology because the target system needs to be built quickly, is user-driven, and must accommodate changes during development. XP supports short iterations, intensive communication with users, and continuous testing, making it suitable for building an attendance application that will be directly used by employees and administrators. The system is implemented using PHP and MySQL, and Leaflet.js is utilized to visualize employee and office coordinates on an interactive map, aligning the technical stack with the requirement for location-aware, browser-based attendance.

Functionally, the system is designed to meet the requirements defined in the final project proposal: role-based authentication, employee and division management, attendance in–out with GPS and selfie, automatic recording of time and coordinates, and downloadable attendance recaps. Previous black-box testing in the proposal showed that the core modules run according to expectations, indicating that the proposed approach can improve the accuracy, security, and timeliness of attendance data at PT. Fazana Berkah Mulia. Therefore, this paper not only documents the motivation and problem background but also presents the design, development method, and functional results so that the solution can be replicated or adapted by other organizations facing similar attendance-control challenges

1.1 Literature Review

The literature on web-based attendance systems generally agrees that shifting from manual or semi-manual recording to an online system is the most effective way to solve problems of data manipulation, slow recapitulation, and limited monitoring. (Pradana & Mayang Sari, 2025) showed in their web-based attendance system for the Sei Semayang village office that digitization "can overcome the weaknesses of manual systems that are prone to errors, slow to recap, and lack transparency," especially when real-time logging is paired with automatic report generation for management. (Hafizhah & Hidayat, 2025) arrived at a similar conclusion in a web–mobile attendance system using the XP method and QR Code: attendance time became faster and recording errors decreased, confirming that web platforms are suitable for institutions that previously relied on paper forms.

Several studies in your proposal go a step further by adding spatial validation. (Nosiyanto et al., 2024) developed a web-based attendance application for CV Pramana Mukti Jaya using Extreme Programming and an integration of Leaflet.js, so every attendance record carries both time and geographic position. They reported that map-based interaction increased accuracy and made the system more usable for field workers. This is directly relevant to PT Fazana Berkah Mulia because your requirement-gathering section states that attendance "may only be accepted within the designated office/work area (geofence/radius)" and that HR wants selfie evidence at check-in/check-out. Your design therefore mirrors this line of research by pairing Leaflet.js-based GPS validation with browser-based selfie capture, so presence is validated by where the employee is and who is doing the check-in.

From the software engineering side, previous authors have already justified using Extreme Programming (XP) or its variant PXP for attendance systems. (Nasirin & Djaksana, 2021) built a web-based attendance system for PD Trivia Oktana Mandiri using Personal Extreme Programming and concluded that it could "handle changes in requirements without having to repeat the entire development process," while still passing black-box testing on the core features. Your proposal follows the same logic: because the system will be used daily by HR and employees, requirements such as adding new locations, changing radius, or extending leave categories must remain editable; XP with short iterations, continuous user feedback, and fast releases has been shown in these studies to work in exactly that kind of environment.

Beyond those four core studies, the proposal also cites several works that strengthen your argument for a centralized, role-based, web attendance application. (Muhammad Erviandi Akbar et al., 2025) built a school attendance system using XP and found that moving to the web removed typical manual problems (lost sheets, late recap, inaccurate names) while keeping the interface responsive across devices this supports your decision to make the employee module mobile-friendly. (Cesario et al., 2025) designed a website-based attendance system for PT Baruman Jaya Perkasa with clear separation of admin–employee roles and downloadable reports; your system adopts the same role-based structure but adds stricter validation (GPS + selfie), so it can serve a company where "titip absen" is a real risk. (Maulidah, 2022) showed that even small businesses (e-laundry) benefit from web-based attendance because recap becomes faster and data is stored centrally evidence that your browser-based approach is portable to non-office contexts. Finally, (Sonny & Rizki, 2021) developed a web attendance system with GPS technology at PT BPR Dana Makmur Batam, confirming that GPS constraints can be applied in real organizational settings and that location-aware attendance increases data trustworthiness. Taken together, these additional studies give you at least ten related works that all point toward the same solution pattern: web-based, centrally stored, role-aware, and equipped with location or identity validation.

In summary, your journal paper sits right in the middle of this literature stream: it adopts the already proven shift from manual to web attendance (Pradana & Mayang Sari, 2025), it follows the newer branch that embeds maps and geofencing for location-trusted presence (Nosiyanto et al., 2024), and it uses an agile method that earlier attendance systems have successfully implemented (Nasirin & Djaksana, 2021). What your work adds based on the proposal is the dual validation (GPS + selfie) and the complete daily/monthly recap for PT Fazana Berkah Mulia, which several of the earlier studies did not integrate in one system.

2. Research Methods

This research was carried out using the Extreme Programming (XP) development flow. The process begins with Problem Identification, where literature research, on-site observation, and interviews with HR and employees at PT. Fazana Berkah Mulia were conducted to find the main issues in the current attendance process (manual recording, no location validation, no selfie proof). The next stage is Requirements Analysis, in which the functional and non-functional requirements of the web-based attendance system were defined, such as role-based login, employee and division management, GPS/radius validation, selfie capture, and daily/monthly attendance reports.

After the requirements were clarified, the research proceeded to System Design. At this stage, the system context, data flow, and system architecture were modeled to show how attendance data (time, coordinates, and photo) would be processed and stored in the database. The design then became the reference for Implementation/Coding, where the application was built using PHP, MySQL, HTML, CSS, and JavaScript, and integrated with Leaflet.js for map visualization and Webcam/camera capture for selfie attendance.

The running system was then evaluated in the System Testing phase using black-box testing to verify that every feature (login, attendance in/out, GPS check, selfie saving, and reports) produced the expected output. Testing results were documented in a testing table. After that, the results of analysis, design, implementation, and testing were organized in the Research Report Preparation stage to be presented as a scientific paper.

Because XP is iterative, feedback from testing or users can flow back to earlier stages (analysis, design, or implementation) for refinement before the system is finalized, as shown in Fig. 1 Flow Diagram. The cycle keeps repeating until the features are stable, and then the process proceeds to the final Release/Publication stage, where the completed system and research results are delivered.

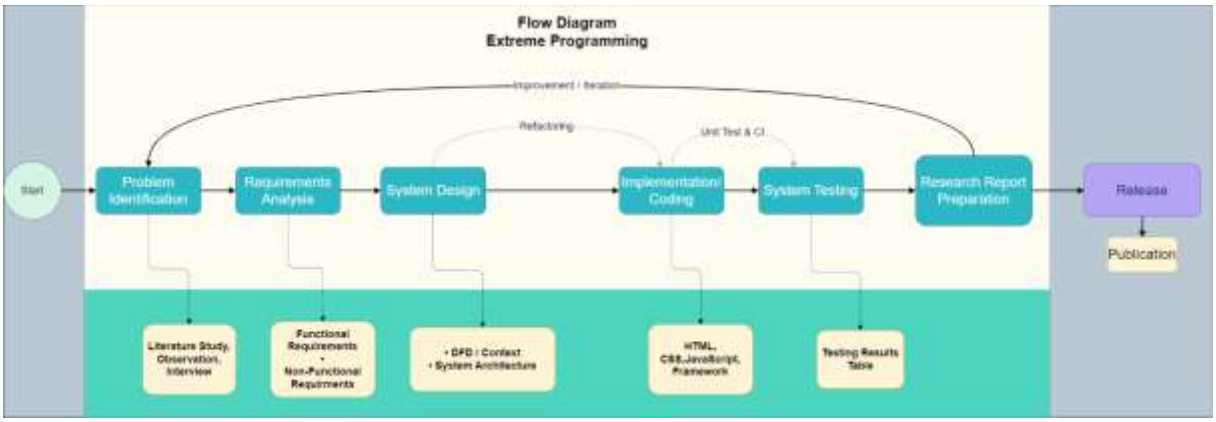

Fig. 1 Flow Diagram

Functional Requirement

The functional requirements of the proposed web-based attendance system are summarized in Table 1. Functional Requirement. These requirements ensure that the system supports both administrative operations and employee attendance processes. As shown in the table, the system first provides secure Admin & Employee Login to differentiate access rights. It then facilitates Employee & Division Management so admins can maintain organizational data. Core attendance features are accommodated through Check-In & Check-Out Attendance with selfie and GPS validation, supported by Automatic Recording of time and location to reduce manual errors. In addition, the system includes Leave, Sick, and Absence Management to handle non-attendance cases, and Daily & Monthly Recap to generate attendance reports in downloadable formats. Finally, a Monitoring Dashboard is provided to give admins a real-time overview of attendance data, making supervision more efficient, as detailed in Table 1.

Table 1. Functional Requirment

No	**Functional Requirement**	**Description**
1	Admin & Employee Login	The system provides a login page with username–password authentication according to the user's access rights.
2	Employee & Division Management	Admin can add, edit, and delete employee data as well as company divisions.
3	Check-In & Check-Out Attendance	Employees can perform attendance with selfie photo verification and real-time GPS location validation.
4	Automatic Recording	The system automatically records check-in time, check-out time, and employee location.
5	Leave, Sick, and Absence Management	Admin can manage leave, sick, and absence (alpha) data based on employee submissions.
6	Daily & Monthly Recap	The system provides daily and monthly attendance reports that can be downloaded (Excel/PDF).
7	Monitoring Dashboard	Admin has a dashboard that displays a real-time summary of attendance data.

Non-Functional Requirement

The quality aspects of the attendance system are outlined in Table 2. Non-Functional Requirement. These requirements do not add new features, but make sure the system is actually pleasant, safe, and reliable to use. As shown in the table, the system must be accessible from both desktop and mobile so employees can check in

anywhere. It must also provide security through authentication, selfie verification, and GPS radius checking to avoid fake attendance. In addition, the interface is designed for usability, meaning it is simple and responsive for both admin and employees. From the technical side, the system must have good system performance so attendance data is processed in real time and reports can be exported quickly. Finally, maintainability is ensured by developing the system with an organized structure and commonly used libraries (Webcam.js, Leaflet.js, MySQL), making future fixes or enhancements easier, as detailed in Table 2.

Table 2. Non-Functional Requirment

No.	**Non-Functional Requirement**	**Description**
1	Accessibility	The system is web-based and can be accessed via computers and smartphones with an internet connection.
2	Security	The system is equipped with login authentication, selfie photo verification, and GPS validation with a radius limit to prevent attendance manipulation.
3	Usability	The interface is designed to be simple, responsive, and easy to understand for both admins and employees.
4	System Performance	The system processes attendance data in real time without noticeable lag and is able to export reports quickly.
5	Maintainability	The system is developed with an organized structure using frameworks/libraries (Webcam.js, Leaflet.js, MySQL) so it is easy to fix or further develop.

DFD

The context diagram illustrates that the system acts as a central platform connecting two main external entities: Employee and Admin. Employees access the system to log in, submit attendance with selfie and location, send leave requests, and view their own recap, while Admin supplies master data and receives attendance reports. This flow is then elaborated in Fig. 2 DFD, where the high-level interactions are broken down into system processes such as login/authentication, attendance recording with GPS validation, leave management, and report generation. In Fig. 2, each data movement shown in the context diagram is detailed into specific data stores (e.g. employee data, attendance data, leave data) and processes, making it clear how the system validates users, stores their attendance, and finally produces structured output for both employees and admins.

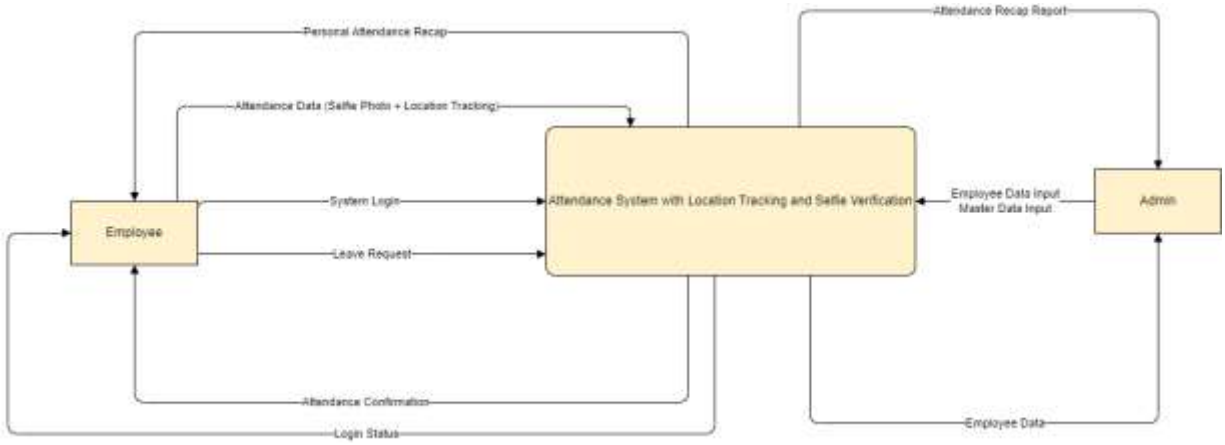

Fig.2 DFD

3. Result and Discussion

ADMIN SYSTEM

The administrator dashboard is designed as a centralized summary page for real-time monitoring of employee attendance. Its primary interface features four key status cards that display Total Active Employees, Total Present, Total Absence/Alpa, and Sick/Leave/Permission, so the admin can see the daily condition at a glance without opening long reports. As shown in Fig. 3 Dashboard Admin, these indicators are placed in one consolidated view and are supported by navigation links to other modules (Employee, Master Data, Attendance Recap), making the dashboard a practical entry point for HR monitoring and attendance control.

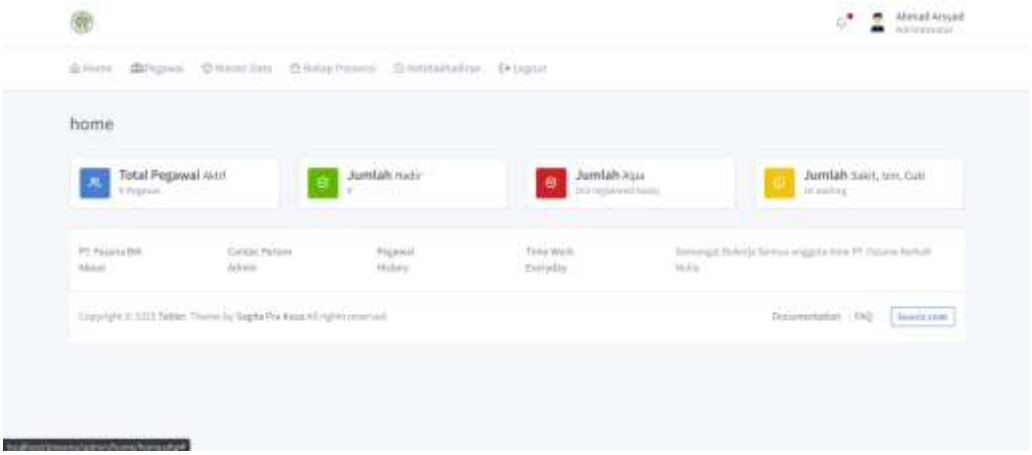

Fig. 3 Dashboard Admin

Employee Data

The "Employee Data" page functions as the master table for managing all registered staff in the system. It displays key attributes such as employee ID (NIP), name, username, role (admin/employee), and position. The administrator can add new records using the Add Data button, and each row is equipped with Detail, Edit, and Delete actions to view, modify, or remove employee information. This module ensures that only valid and up-to-date employee accounts can access the attendance system, as shown in Fig. 4 Slide Employee Data.

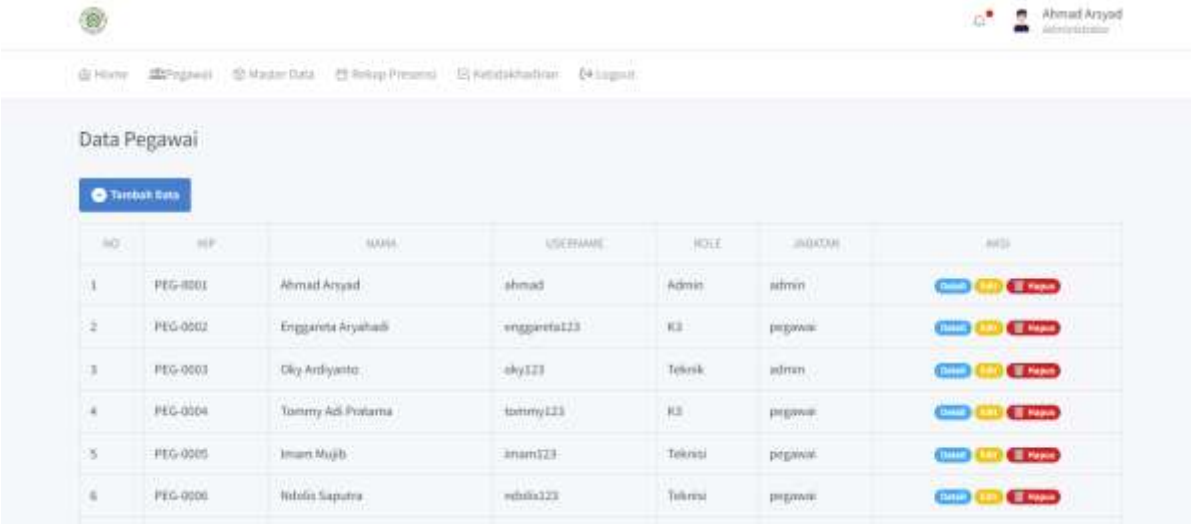

Fig. 4 Slide Employee Data

Master Data

Position Data

The “Position Data” page is part of the Master Data module and is used to manage the list of job titles in the company. The table displays all registered positions, and the admin can add new ones via the Add Data button. Each position is provided with Edit and Delete actions so administrators can update or remove job titles, ensuring that employee records and attendance reports remain aligned with the actual organizational structure of the company, as shown in Fig. 5 Position Data.

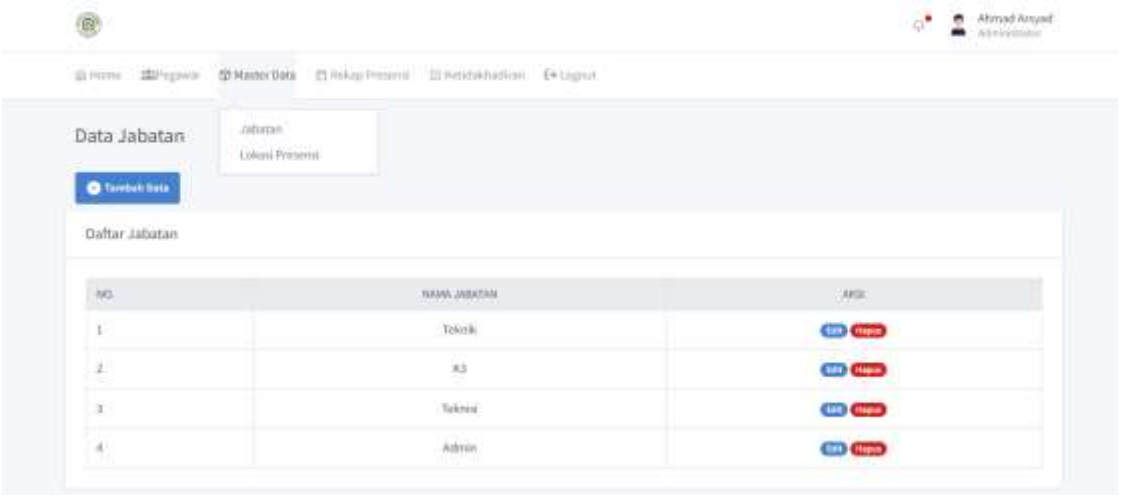

Fig. 5 Position Data

Attendance Location Data

The “Attendance Location Data” page manages the geofenced areas where attendance is allowed. Each record stores the location name, location type, latitude–longitude coordinates, and the permitted radius. Administrators can add new locations and use the Detail, Edit, and Delete actions to keep office or worksite boundaries accurate, so attendance is only accepted from authorized areas, as shown in Fig. 6 Attendance Location Data.

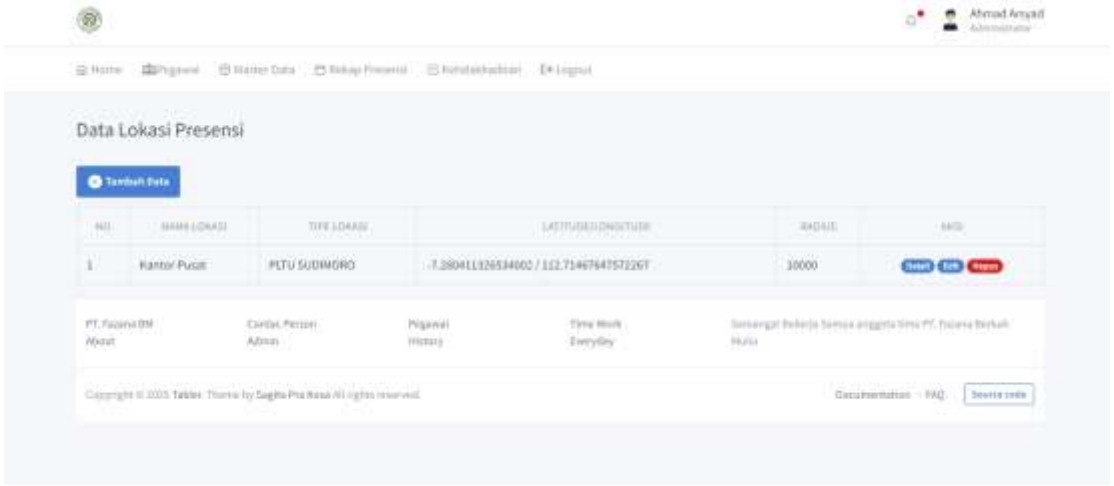

Fig. 6 Attendance Location Data

Daily Attendance Recap

The “Daily Attendance Recap” page provides a filtered summary of employee presence for a selected date and, if needed, for a specific location. The table displays NIP, name, position, attendance location, attendance status (present/not present), check-in and check-out time, lateness (in minutes), and total work duration. Administrators can show the data instantly and export it to CSV so daily monitoring and reporting become faster and more accurate, as shown in Fig. 7 Daily Attendance Recap.

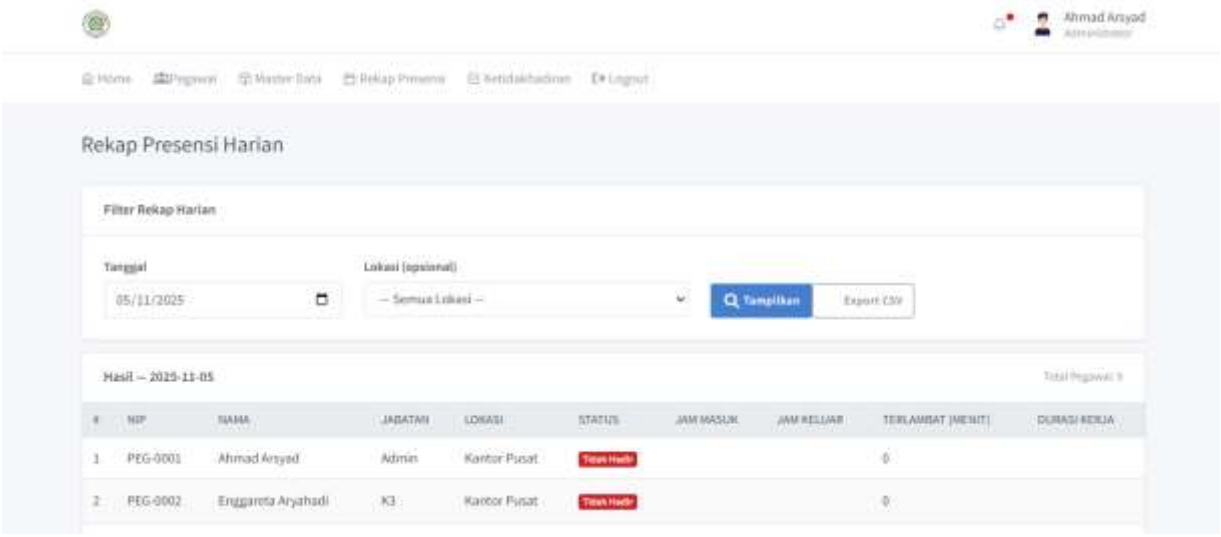

Fig. 7 Daily Attendance Recap

Monthly Attendance Recap

The “Monthly Attendance Recap” page summarizes employee attendance for a selected month and location. It calculates total presence, absence (alpa), late occurrences, and total working hours based on the defined working days. The recap can be filtered and exported to CSV, making it easier for HR to produce periodic reports and evaluate discipline over time, as shown in Fig. 8 Monthly Attendance Recap.

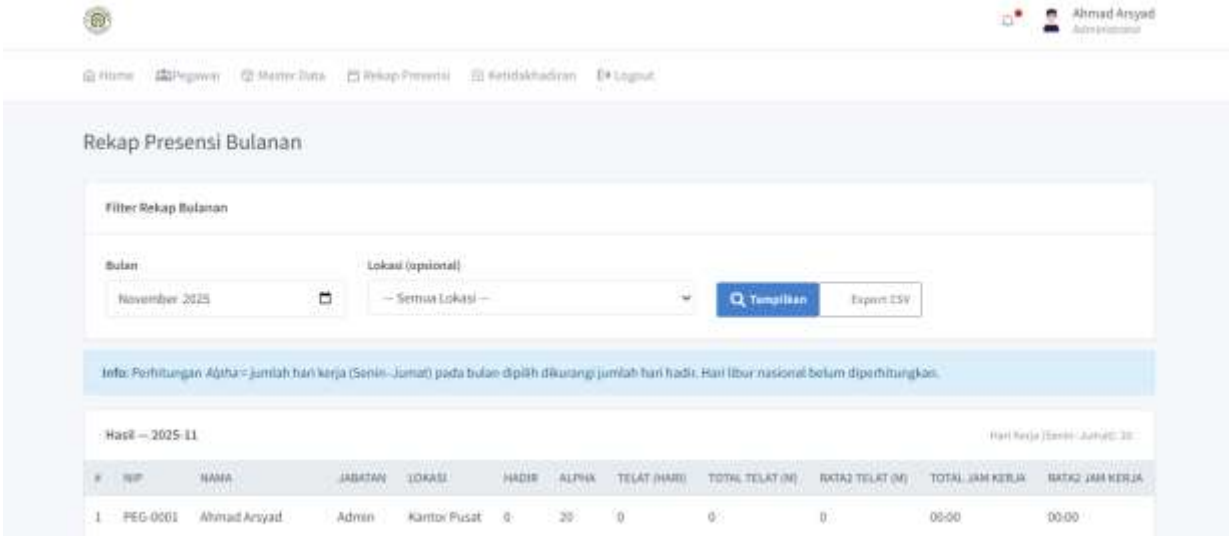

Fig 8. Monthly Attendance Recap

Employee System

The employee home page provides a simple interface for daily attendance. The left card shows the current date and a real-time clock with a Check-In button for starting work. The right card displays the Check-Out status and notifies the user if it is not yet time to leave, including the expected checkout time. This layout helps employees do attendance in the right sequence and schedule, as shown in Fig. 9 Dashboard Employee.

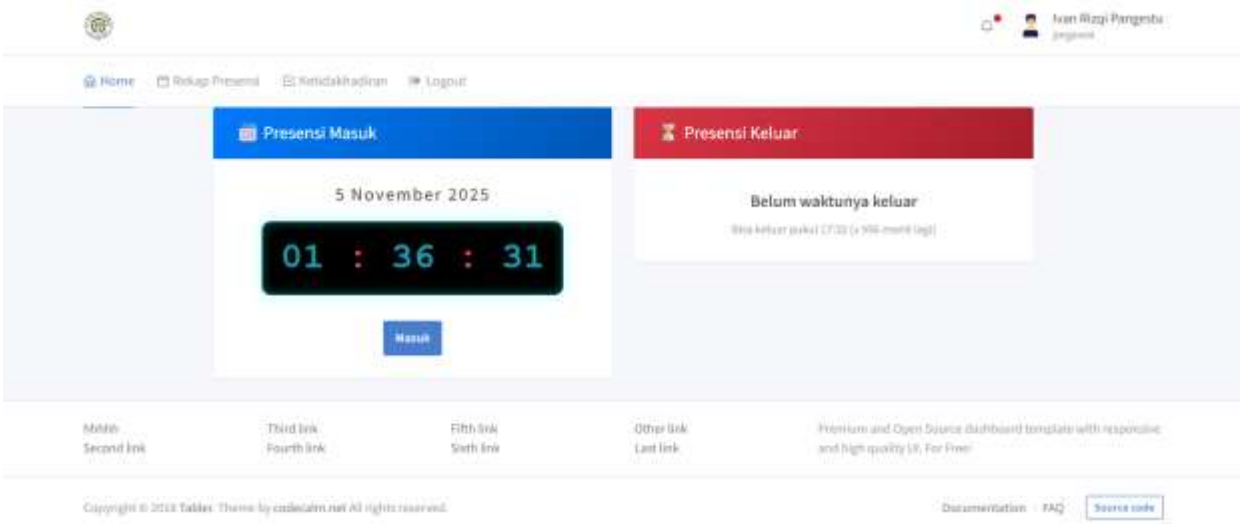

Fig 9. Dashboard Employee

The "Check-In" page combines identity and location validation in one screen. At the top, the system displays attendance status (inside/outside radius), distance to the office, allowed radius, GPS accuracy, and both employee and office coordinates. On the left, the user captures a selfie as proof of presence, while on the right an interactive Leaflet map shows the user's current position compared to the office geofence. This setup guarantees that attendance is only recorded when the employee is in the authorized area and using their own identity, as shown in Fig. 10 Dashboard Employee.

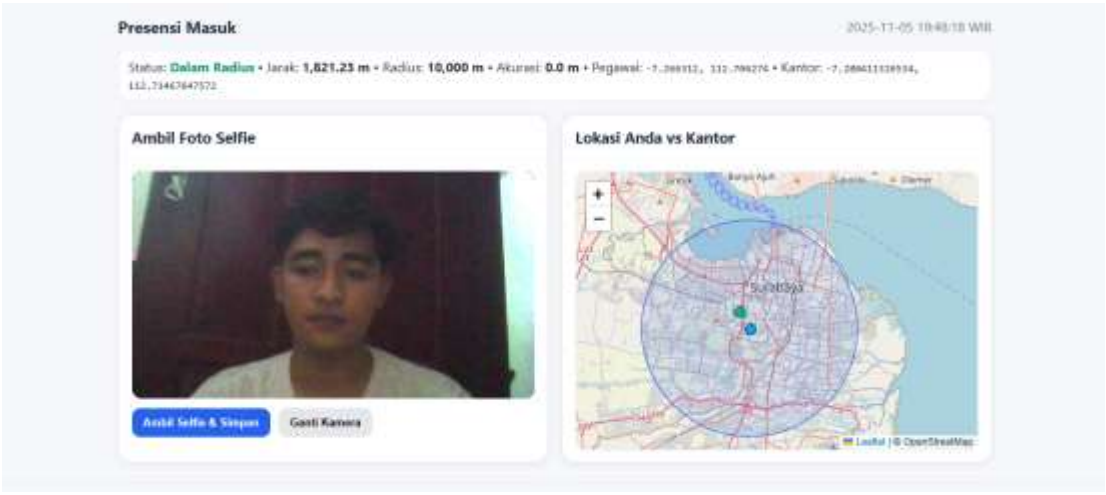

Fig 10. Dashboard Employee

The employee "Attendance Recap" page allows users to view their own attendance history by month and year. After filtering, the table displays the date, attendance location, status, check-in and check-out times, lateness,

work duration, and a link to the captured selfie photo. The data can also be exported to Excel so employees can monitor their own discipline and keep a personal archive of attendance data, as shown in Fig. 11 Dashboard Employee.

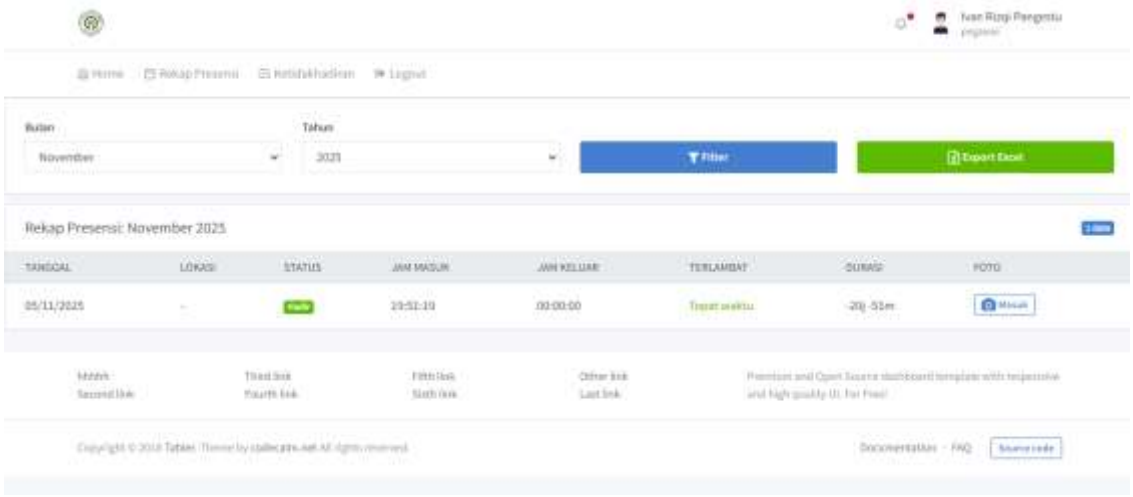

Fig 11. Dashboard Employee

4. Conclusions

The research successfully designed and implemented a web-based digital attendance system for PT. Fazana Berkah Mulia that combines GPS-based geofencing with selfie verification so that every attendance record can be traced to both the correct person and the correct location. The system fulfilled the functional requirements formulated at the beginning of the research, namely role-based login for admin and employees, master data management, check-in and check-out with location validation, interactive map display using Leaflet.js, and daily monthly attendance recap that can be exported. Black-box testing showed that core modules authentication, attendance recording, geolocation checking, selfie capture, and reporting ran according to specification, so the system can be used to reduce attendance manipulation, accelerate recap, and improve HR monitoring in real time.

Methodologically, the use of Extreme Programming (XP) was proven to be suitable for this case because the organization required quick delivery and the possibility to change requirements during development (e.g., adding new locations or attendance categories). Short iterations and continuous feedback helped align the system with actual user needs in the field. Even so, this research still has limitations: the system has not yet been integrated with payroll/HRIS modules and still relies on browser/device GPS quality, which may vary by hardware and network. Future work can focus on (1) adding automatic leave approval workflows, (2) integrating with payroll so that attendance directly affects salaries, and (3) hardening security for photo storage and location spoofing detection.

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