



Development of Attendance System Applications Using Location Coordinate Validation in Collaboration with Mobile Application

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Abstract. Along with the times, with advances in technology, the need for an attendance system at schools, in companies, or in organizations is increasing. At this time, students and workers find and identify that reliability is a key indicator of the quality of service facilities and infrastructure to determine the choice of place to work or study. An example of the reliability of the attendance system will get its own section in terms of effectiveness and ease of use. Micro, Small, and Medium-sized Enterprises (MSME), referred to as cooperative company in Indonesia, operates in the cooperative sector and focuses on addressing challenges using online presence system technology. Therefore, MSME requires an application system that integrates with the existing task management system to streamline the process of gathering reports through an efficient attendance system, all within a single application. The development of this presence system website is undertaken using the prototype method. Following the completion of the development process, the researcher conducts testing through two methods: black box testing and user acceptance testing. The findings of this study encompass the design of the MSME business model and a website tailored for internal usage within the organization.

Keywords: attendance system, attendance with location, task management, prototype

1 Introduction

In the evolving era, the demand for reliable and efficient attendance systems is increasing across various environments such as schools, companies, and organizations. A robust attendance system has become a crucial factor in assessing the quality of services and infrastructure in these places. However, there are still issues with several existing attendance systems, especially in terms of usability, particularly for field workers. Therefore, this research aims to address these problems by developing mobile and web-based attendance system application that is integrated with task management.

Traditionally, employee attendance has posed a significant challenge for organization, necessitating Human Resource Department to invest considerable time and effort in manually recording attendance. The existing biometric attendance systems are not fully automated, resulting in time wastage, operational complexity, and the need for fingerprint scanning queues to log attendance. In the contemporary age, nearly everyone possesses a smartphone and remains connected to the internet consistently. This study proposes the utilization of smartphones owned by employee to monitor attendance, leveraging the ubiquity of these devices in the modern era [1].

In the context of Micro, Small, and Medium-sized Enterprises (MSME) for example cooperative companies, the challenge of managing workforce attendance becomes particularly pronounced when dealing with field workers. These are employees whose tasks are carried out in dispersed locations, often away from a centralized office. Ensuring their presence in the designated work areas poses a unique set of difficulties. Traditionally, tracking the attendance of field workers has been labour-intensive and error-prone due to manual methods of data collection. This scenario becomes even more complex when considering the need for accurate and timely reporting, especially for tasks that involve visiting multiple sites or remote locations.

The existing attendance systems, while beneficial for office-based employees, often fall short in catering to the needs of field workers. Ensuring their consistent attendance, verifying their locations, and collecting relevant data can be a cumbersome process. This paper recognizes the challenges faced by Micro, Small, and Medium-sized Enterprises (MSME) in managing the attendance of their dispersed workforce and acknowledges the significance of addressing these challenges. Therefore, the focus of this research extends to the development of a mobile and web-based attendance system application that seamlessly integrates with task management and is tailored to the unique requirements of field workers.

By leveraging the ubiquity of smartphones and consistent internet connectivity, this study proposes a solution that allows field workers to mark their attendance using their own devices. This approach not only eliminates the need for physical presence at a central location but also enhances accuracy, reduces administrative overhead, and streamlines the overall attendance tracking process. The developed application seeks to bridge the gap between traditional attendance systems and the specific needs of field workers.

Through this endeavour, the research aims to provide an innovative solution that empowers MSMEs with an efficient and user-friendly attendance system tailored to the challenges of a dispersed workforce. By enabling accurate and real-time attendance tracking in the field, this system holds the potential to optimize resource allocation, enhance operational efficiency, and contribute to the overall growth and sustainability of Micro, Small, and Medium-sized Enterprises.

2 Literature Review

In this literature review, the related review relevant to the development of attendance system for the MSME will be presented. Some essential concepts that will be discussed include attendance system, dashboard, and related work.

2.1 Attendance System

The attendance system is a system used to track and record the presence of individuals within an institution or organization. This system can be implemented in various ways, including using physical attendance machines or electronic systems. Physical attendance machines typically come in the form of fingerprint machines or access card systems that allow each individual to check in by placing their fingerprint or card on the machine. On the other hand, electronic systems enable individuals to check in and check out through computers or mobile devices [2]. A smart attendance system is a solution designed to automate student attendance management through the use of technology [3].

The BYOD (Bring Your Own Device) trend permits workers to utilize their smartphones as tools for daily tasks and even as devices to mark their attendance. The security of the employee attendance system holds significance in guaranteeing that employees avoid engaging in deceitful activities while logging their attendance and during the monitoring of their work-related actions within working hours [4]. This attendance system is crucial for efficiently and accurately managing the attendance of employees or members of the organization.

2.2 Dashboard

A dashboard is an interactive online platform utilized to visualize and track specific data in real-time [5]. The dashboard in this context is similar to a dashboard in a car, aiming to present information in a way that doesn't distract the user. To facilitate user understanding of the dashboard's content, original data is usually summarized and presented using graphs, tables, gauges, and other visual elements. This is intended to provide a concise yet informative overview of the information presented on the dashboard [6].

2.3 Related Work

The following will describe some previous research written by several authors from various countries related to the research being raised, namely the attendance system application method for frontliner employees according to their jobs. This is used as a reference for the research to be carried out.

Table 1. Related Work

Author	Developed System	Key Findings
Dani Yusuf et al [7].	Attendance System, Checkpoint Location	This application is developed by creating an Android-based application using location coordinate validation and the user's phone number, which can facilitate employees in performing attendance.
Fauziah, Z. et al [8].	Attendance System, Website Application	Creating a attendance application based on a website to meet the needs of a school. This research is conducted using the prototype method. The purpose of this application is to assist teachers at Junior High School in recording reports, facilitate attendance activities more conveniently and effectively in the classroom, and also to make it easier for supervisors to monitor the report recording.
Lia Kamelia et al [9].	Attendance System, Location, Smartphone	Creating a Real-time Online attendance system application using fingerprint and Global Positioning System (GPS) features on smartphones. This research is conducted using the Design and Development Research methodology. The primary goal of this application is for attendance monitoring using fingerprint and GPS.
Tan, P. et al [10].	Attendance System	Creating an application for teaching using RFID and IoT Technology, where instructors can perform data collection related to attendance and several other activities.
Asim Balarabe Yazid et al [11].	Attendance System, Checkpoint Location	Creating a multi-factor authentication algorithm to prevent fake attendance in various organizations such as schools, universities, and organizations. The existing manual methods of taking attendance are vulnerable to fraudulent practices where individuals might sign the attendance on behalf of others who are absent. The proposed algorithm utilizes a combination of four authentication factors to address this issue geographical location (GPS), face recognition, QR code, and time restrictions.
Ke-Wen Huang et al [12].	Checkpoint Location	The paper offers insights into utilizing location information to counter Fake Base Station (FBS) attacks on wireless User Equipment (UE). By implementing the proposed schemes, the risk of connecting to FBS can be minimized, thereby enhancing system security.

Author	Developed System	Key Findings
Apurva Patil et al [13].	Attendance Management System, QR Code, & Location.	The paper outlines the creation of a Multichannel Attendance Management System that leverages QR codes and location tracking for streamlining attendance procedures. It is tailored to function seamlessly with mobile devices and their geo-tagging capabilities, enabling a convenient and effective means of attendance monitoring. The paper delves into the advantages of adopting this system, such as enhanced precision and diminished administrative burdens. Furthermore, the authors explore the possibility of integrating it with pre-existing attendance management software.
Ismail N et al [14].	Web-based Attendance System	The paper introduces a web-based attendance system for university classrooms, utilizing advanced face recognition through deep learning. Its aim is to enhance the precision and effectiveness of attendance monitoring. The system's dynamic nature stems from its incorporation of a database for storing individual student's facial characteristics data. The paper offers a detailed account of the proposed attendance system, examines related studies in face recognition methods and attendance applications, presents the findings and analyses of the system, and concludes with acknowledgments.

Based on the related work summarized in Table 1, it can be concluded that each study conducted has its own strengths and weaknesses.

3 Methodology

3.1 Application Development Methodology

The method used in designing this application is the prototyping method. The prototype design method is employed as an approach in system development that focuses on creating an initial model or prototype of the system to be developed. This approach allows developers to quickly create an initial version of the system that can be tested and evaluated by users or other stakeholders. The prototype typically includes the key features of the planned system, although it may not be fully complete. The advantage of the prototype design method is that it enables developers to obtain early feedback from users, allowing for improvements and adjustments before full implementation [15].

3.2 Systematic Problem Solving

Systematic Problem Solving is an approach employed to analyze and address issues through structured and organized steps. This approach involves a comprehensive grasp

of the data and information pertinent to the problem, as well as the utilization of appropriate analysis methods and tools to resolve the issue [16].

The problem-solving methodology is the approach or structure used to organize a research study. The systematic problem-solving approach is necessary to provide a descriptive explanation of the overview and stages to be taken in this research to achieve the desired solution or outcomes. In the development of this research, the prototyping method is utilized. To summarize the results of the chosen method, this research employs three stages: the identification stage, system development, and the conclusion and recommendations stage.

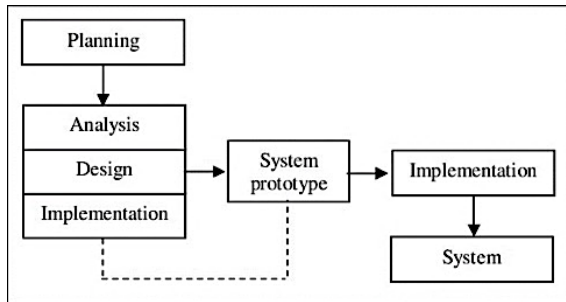


Fig. 1. Systematic Problem Solving

4 Result & Discussion

4.1 Analysis of Interview Results

In this section, the researcher will analyze the data from interviews with one of MSME in Bogor which is one of city in Indonesia. We discussed with the Human Resource Development (HRD) by presenting several questions in a table. Based on the interview results with the HRD from MSME, it can be concluded that it requires an attendance application that can be used by employees to record attendance and monitor employee presence through the application. The fundamental keys that occur in that MSME is they have many field employees that distributed in several working areas. The data obtained will be analyzed in the user needs analysis.

4.2 Analysis of User Needs

In this section, the identification of user requirements for the application will be conducted. The identification results are based on the data obtained from interview outcomes, where user activities and needs consist of the activities and functions present in the website application system, as indicated in the following table.

Table 2. Analysis of User Needs

Company	Requirement
MSME in Bogor, Indonesia	<ol style="list-style-type: none"> 1. Login feature to authenticate the entire attendance application system. 2. Feature to display, add, modify, and delete employee data. 3. Feature to display the attendance data of each employee based on the current location. 4. Assignment feature to create and view tasks for employees. 5. Operational target feature to view the tasks assigned to employees. 6. User feature to add accounts for employees to gain access to the website application. Reporting feature to view the progress of tasks for each employee and analyze employee performance based on a specific time frame. 7. Change password feature to assist employees in changing their account passwords. 8. Logout feature for the admin to exit the website.

4.3 Functional Requirements

Functional requirements describe what the system must do, how the system behaves, and the functionality the system needs to possess. Based on the definition above, several functional requirements can be identified to determine the necessary application functions. Here are the functional requirements of the application, as shown below.

Table 3. Functional Requirements

No	Function	User Story	Group Modul
1	Login	As an admin, I want to log in and access the system	Login
2	Logout	As an admin, I want to log out to exit the system	Account
3	Dashboard	As an admin, I want to view the Dashboard to monitor the available data	Dashboard
4	View the list of all employees	As an admin, I want to view the list of all employees to see the registered employees	Employees
5	View details of a specific employee	As an admin, I want to view the details of a specific employee to see comprehensive information about them	
6	Add a new employee	As an admin, I want to add a new employee	
7	Modify a specific employee	As an admin, I want to modify a specific employee to update their information	
8	Delete a specific employee	As an admin, I want to delete a specific employee to remove data for those who are no longer working	
9	View the list of all employee groups	As an admin, I want to view the list of all employee groups to see the registered groups	Employee Groups

10	View details of a specific employee group	As an admin, I want to view the details of a specific employee group to see comprehensive information about them	
11	View the list of all attendance logs	As an admin, I want to view the list of all attendance logs to see the registered logs	Attendance Logs
12	View details of a specific attendance log	As an admin, I want to view the details of a specific attendance log to see comprehensive information about them	
13	View the list of all task areas	As an admin, I want to view the list of all task areas to see the registered task areas	Task Areas
14	Create a new assignment area As an admin	As an admin, I want to create a new assignment area	
15	View a specific assignment area	As an admin I want to view a specific assignment area to see detailed information	
16	Create details for a specific assignment area	As an admin I want to create details for a specific assignment area	
17	View the list of all offices	As an admin I want to view the list of all offices to see the registered offices	Offices
18	View details of a specific office	As an admin I want to view details of a specific office to see comprehensive information	
19	View the list of all operational targets	As an admin I want to view the list of all operational targets to see the registered targets	Operational Targets
20	View details of a specific operational target	As an admin I want to view details of a specific operational target to see comprehensive information	
21	View the list of all assignment statuses	As an admin I want to view the list of all assignment statuses to see the registered statuses	Assignment Statuses
22	View the list of all employee-specific reports	As an admin I want to view the list of all employee-specific reports to see registered reports	Employee-Specific Reports
23	View the list of all group-specific reports	As an admin I want to view the list of all group-specific reports to see registered reports	Group-Specific Reports
24	View the list of all employee-specific activities	As an admin I want to view the list of all employee-specific activities to see registered activities	Employee-Specific Activities.
25	View the list of all users	As an admin I want to view the list of all users to see registered users	User.
26	<i>Reset password for a specific user</i>	As an admin, I want to reset the password for a specific user account to assist when a user forgets their password.	
27	<i>Generate a specific user</i>	As an admin, I want to generate a user account for a specific employee user to create a username and password that the user will use.	<i>Generate User.</i>

4.4 Implementation & Results

The application design for the employee attendance recording process is illustrated in Figure 3. Users have the option to utilize the check-in button to initiate the check-in process for attendance.

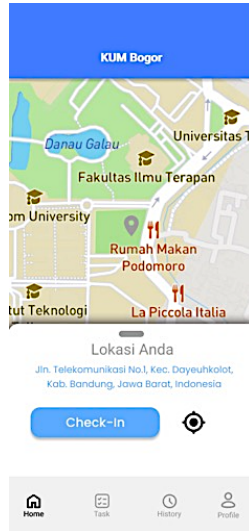


Fig. 2. Check-In in Mobile Apps

Within this feature, the finer aspects of the attendance log are also observable. These encompass the employee's name, timestamp, accompanying photo evidence, and geographical coordinates linked to the respective log entry.

Based on the information from the mobile application, the application can collect the log attendance system as depicted in the figure below. It is evident that this attendance log function serves to assist users in tracking the attendance records of each employee. Furthermore, users are empowered to oversee the performance of said employees through this system.

A screenshot of a web application interface showing an 'Absensi Log' table. The table has columns for '#', 'Pegawai', 'Tanggal Absensi', 'Waktu Absensi', 'Latitude', and 'Longitude'. The data rows list employees like 'Jhon Doe' and 'Anton Sumarno' with their respective absence dates and times. The interface includes a sidebar menu on the left with options like 'Dashboard', 'Data Pegawai', 'Absensi Log', and 'Kantor & Target'. A 'Tambah Absensi Log' button is visible at the top of the table area. The table shows 16 rows of data, with the first 11 rows for 'Anton Sumarno' and the last 5 rows for 'Jhon Doe'. Each row has a small icon on the right side, possibly for editing or deleting the entry.

Fig. 3. Log Attendance System List

For each detail of the check activity, it can be observed as depicted in the image below. This can serve as a comprehensive method to ensure that employees genuinely perform their check-in within the designated work area.

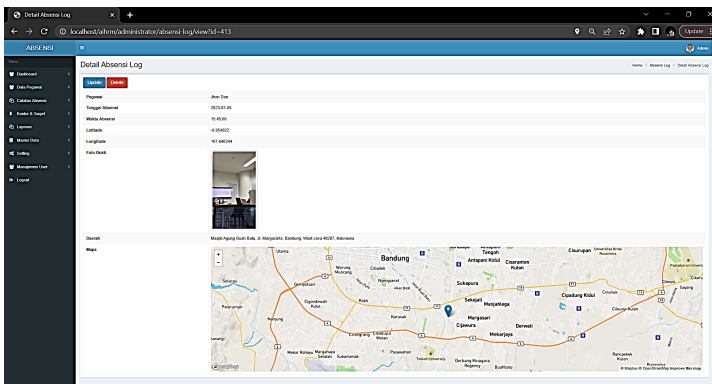


Fig. 4. Log Attendance System Detail

This system can be initiated by assigning tasks to employees to visit specific locations. An example of implementing task management is illustrated in the image below.

Grup Pegawai	Group-Lapangan-A
Start Date	2023-08-07
End Date	2023-08-12
Keterangan	Penagihan

[Tambah Detail](#)

Showing 1-8 of 8 Items.

#	Target Operasi	Rencana Penugasan Pegawai	Penugasan Pegawai Aktual	Rencana Tanggal Penugasan	Tanggal Penugasan Aktual
1	Pasar Suci	Dimas Rizqy Pangestu	---	2023-07-03	(not set)
2	Pasar Kordon	Dimas Rizqy Pangestu	Jhon Doe	2023-07-03	2023-07-05
3	Pasar Ciroyom	Jhon Doe	Radlilo Setia G	2023-07-03	2023-07-06

Fig. 5. Task Management Example

Moreover, there exists a reporting feature that aids users in managing and overseeing the performance of each employee, branch, and division on a monthly basis.

Showing 1-3 of 3 Items.

#	Grup Pegawai	Pegawai	Penugasan Tuntas	Penugasan Belum Tuntas	Persentase Penugasan Belum Tuntas
1	Group-Lapangan-A	Jhon Doe	2/2	0/2	0%
2	Group-Lapangan-A	Radlilo Setia G	0/1	1/1	100%
3	Group Lapangan-B	Joko anwaryo	0/1	1/1	100%

Fig. 6. List of assignment statuses reports.

This implementation is utilized by the administrator to view the complete list of task statuses by selecting the "Task Status" menu. The administrator has the privilege to access and review the comprehensive list of registered task statuses within the system, thereby enabling the administrator to monitor all existing task statuses, as depicted in Fig 7.

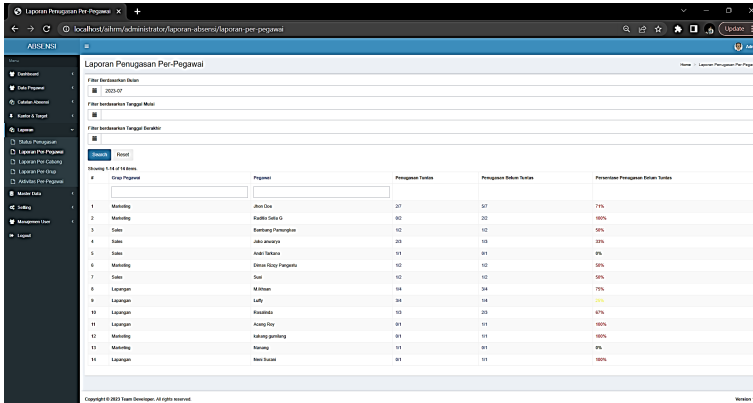


Fig. 7. List of per-employee reports.

This implementation is employed by the administrator to access the entire list of employee-specific reports by selecting the "Employee Reports" menu. The administrator is granted the authority to view the comprehensive roster of registered reports on a per-employee basis within the system, enabling effective monitoring of all existing employee reports, as illustrated in Fig 8.

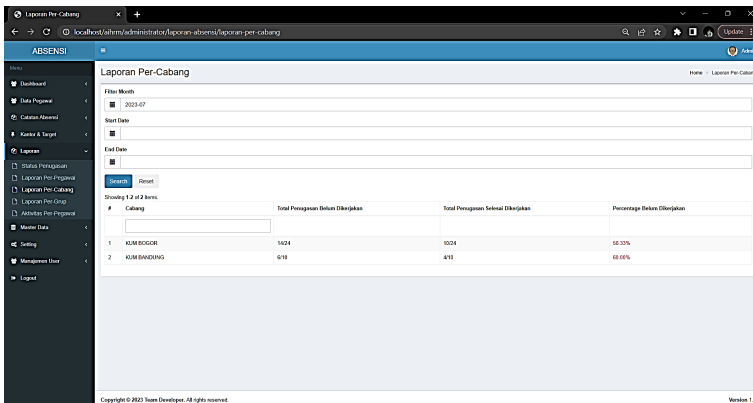


Fig. 8. List of branch reports

This implementation is utilized by administrators to view a comprehensive list of group-specific reports by selecting the "Group Reports" menu. Users have the privilege to access the complete roster of group-specific reports registered within the system, thereby enabling them to monitor all available group-specific reports; see Figure 9.

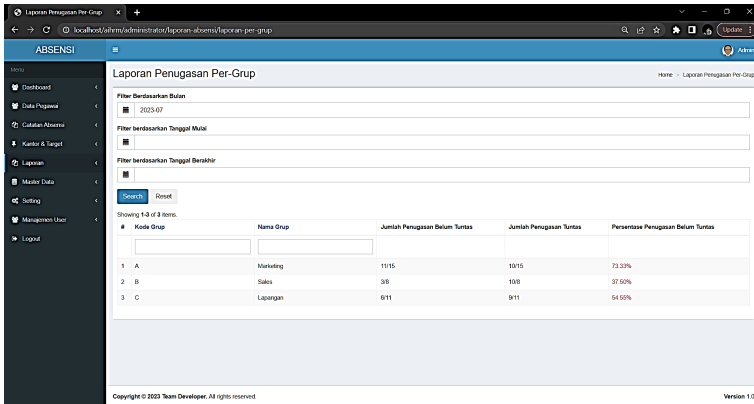


Fig. 9. List of group reports

This implementation is employed by administrators to access a comprehensive list of employee-specific activities by selecting the "Employee Activities" menu. User are granted the authority to review the complete roster of employee-specific activities registered within the system, thus facilitating their ability to monitor all existing employee activities, as illustrated in the image depicted below.

Filter Berdasarkan Bulan

2023-07

Showing 1-14 of 14 items.

#	Grup Pegawai	Pegawai	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
1	Group-Lapangan-A	Jhon Doe	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
2	Group-Lapangan-A	Radito Setia G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Group-Lapangan-B	Bambang Pamungkas	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
4	Group-Lapangan-B	Joko anwaryo	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
5	Group	Andri	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Fig. 10. Activity list employee reports.

To provide a summary of these attendance activities, a dashboard feature was also developed, as depicted in the image below. This dashboard feature serves as a tool for users to access and monitor information regarding the comparative assignment status and the percentage of incomplete assignments per group. This functionality is accessible through the dashboard menu, as illustrated in the image below.

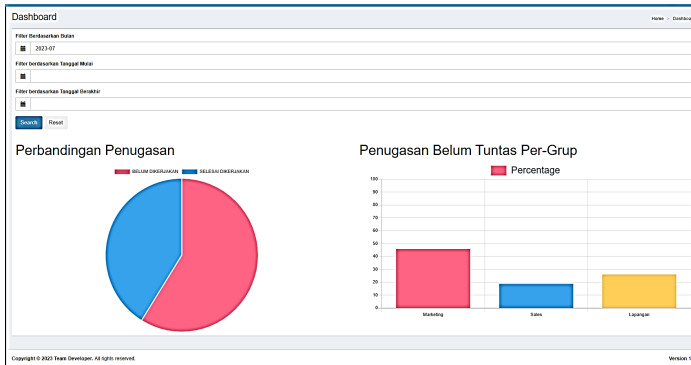


Fig. 11. Dashboard

4.5 Discussion

The conducted research revolves around the development of attendance system that caters to the needs of Micro, Small, and Medium-sized Enterprises (MSME) with a focus on field workers. The research highlights the increasing demand for reliable attendance systems in various sectors and how a robust attendance system can influence the choice of educational institutions, companies, or organizations for students and workers. It emphasizes the importance of an attendance system's reliability and ease of use as indicators of service quality and infrastructure.

The research delves into the challenges faced by MSMEs, particularly in managing the attendance of field workers who operate in dispersed locations. Traditional manual methods of attendance tracking are deemed error-prone and inefficient, especially for tasks that involve visiting multiple sites or remote locations. This research has implemented an attendance system application integrated with task management, tailored to the unique requirements of field workers.

The research outcomes also emphasize the application's features, such as the log attendance system, check-in functionality, and various reporting capabilities. The images provided illustrate the user interface and visual elements of the application, showcasing features like employee-specific reports, branch reports, group reports, and activity lists. These implementations demonstrate how the proposed system addresses the challenges faced by MSMEs in managing attendance, task assignment, and reporting for field workers.

In the end, the research sheds light on the significance of reliable attendance systems in various sectors and highlights the specific challenges faced by MSMEs in managing the attendance of field workers. By proposing a web-based and mobile attendance system integrated with task management, the research aims to provide an innovative solution that streamlines attendance tracking, enhances accuracy, and optimizes resource allocation for MSMEs. The paper's findings and discussions underscore the potential benefits of the proposed system in improving operational efficiency, enabling real-time attendance monitoring, and contributing to the growth and sustainability of MSMEs.

5 Conclusion

Based on the conducted research regarding the implementation of a location-validated attendance system through a website-based platform in conjunction with mobile apps, several pivotal conclusions can be derived. Firstly, the development of this attendance recording application holds immense significance for MSME Bogor Cooperative, as it brings about heightened efficiency and accuracy in tracking attendance. This, in turn, streamlines management processes, minimizes manual errors, and empowers administrative personnel. Secondly, the resolution of issues concerning attendance management, efficiency, and employee productivity can exert a positive influence on the overall operations and performance of MSME Bogor Cooperative. The integration of an attendance system that incorporates location validation and task management facilitates real-time monitoring of employee attendance, curbs unauthorized absences, and fosters smoother work processes. In essence, this integrated attendance system offers substantial advantages to MSME Bogor Cooperative by advancing attendance recording, amplifying operational efficiency, and cultivating a more interconnected and effective work environment. By addressing these facets, the cooperative can attain improved attendance management, optimize employee productivity, and align with the demands of a dynamic workforce.

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