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Implementation of Web-Based Payroll and Attendance System for Effective Employee Management at Bismika Tani Store

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Abstract

Efficiency in managing employee attendance and payroll is crucial for a company's operations. Many businesses still use manual methods, leading to errors, payroll delays, and a lack of data transparency. This study develops a web-based payroll and attendance a system using the waterfall development approach, ensuring flexibility in feature adjustments. The system offers real-time attendance recording with location and photo verification, automated payroll calculations, and comprehensive reporting for management access. Built with PHP Native for the backend and a responsive UI, it enhances user experience. The Waterfall approach allows iterative development to meet operational needs at Bismika Tani Store. Testing shows a 75% reduction in recording errors and a 40% faster payroll process. Real-time reporting improves data transparency, facilitating better attendance and payroll monitoring. This system provides an effective solution for optimizing human resource management and boosting employee productivity at Bismika Tani Store.

Keywords: *Administrative efficiency; Automation; Attendance; Data transparency; Employee management*

Abstrak

Absensi dan penggajian sangat penting bagi operasional perusahaan. Banyak bisnis masih menggunakan metode manual, yang menyebabkan kesalahan pencatatan, keterlambatan penggajian, dan kurangnya transparansi data. Penelitian ini mengembangkan sistem absensi dan penggajian berbasis web dengan pendekatan *Waterfall Development*, memastikan fleksibilitas dalam penyesuaian fitur. Sistem ini menawarkan pencatatan absensi real-time dengan verifikasi lokasi dan foto, perhitungan gaji otomatis, serta pelaporan komprehensif untuk akses manajemen. Dibangun dengan PHP *Native* untuk *backend* dan antarmuka pengguna yang responsif, sistem ini meningkatkan pengalaman pengguna. Pendekatan *Waterfall* memungkinkan pengembangan iteratif untuk memenuhi kebutuhan operasional di Bismika Tani Store. Pengujian menunjukkan pengurangan kesalahan pencatatan hingga 75% dan proses penggajian 40% lebih cepat. Pelaporan *real-time* meningkatkan transparansi data, mempermudah pemantauan absensi dan penggajian. Sistem ini menjadi solusi efektif untuk mengoptimalkan manajemen sumber daya manusia dan meningkatkan produktivitas karyawan di Bismika Tani Store.

Kata kunci: *Efisiensi administrasi; Otomatisasi; Absensi; Transparansi data; Manajemen karyawan.*

1. Introduction

Today digital era showed that information technology has become an importand part of various aspects of human life, including in the fields of attendance and payroll [1]. Employee attendance is a crucial aspect of human resource management at Bismika Tani Store. Accurate attendance records play a vital role in assessing discipline, performance, as well as determining payroll and employee productivity levels [2]. An effective payroll system must be supported by accurate attendance data, as attendance is a key factor in salary calculations and employee performance evaluations.

Bismika Tani is an agricultural store located in Sokopuluhan Village, RT 7/1, Pucakwangi District, Pati Regency, Central Java. This store provides various agricultural needs for local farmers. However, the management of payroll and attendance is still using a manual system. Conventional recording processes, such as writing in books or logging data on computers or laptops, have several weaknesses, such as difficulty in data retrieval, potential data loss, and inaccurate financial reporting. A web-based payroll and attendance application will serve as an effective solution to improve data management efficiency, allowing employees to access and manage information more quickly and easily, while also reducing the risk of data entry errors.[3].

Previous studies have developed various web-based payroll and employee attendance information systems to enhance of employee efficiency and accuracy data management. For instance, Syukron and Abdurrazaq designed a web-based payroll system using the waterfall method, aiming to facilitate the attendance process and ensure fast and accurate salary calculations [4]. Additionally, Ghufron, Meimaharani, and Murti developed a web-based employee attendance and payroll system utilizing geolocation methods to ensure the accuracy of attendance locations and automate salary calculations based on employee presence [5]. Furthermore, Novita and Septian designed a web-based payroll application integrated with fingerprint attendance, employing the CodeIgniter framework and the waterfall method to improve accuracy and efficiency in salary calculations [6]. This study aims to resolve limitations in current payroll and attendance systems, such as the inflexible waterfall method and poor integration requiring manual input, by developing a more adaptable and integrated web-based system for Bismika Tani Store using Agile methodology to enhance accuracy and efficiency in employee data management.

This study proposes developing a web-based information system for payroll and attendance management at Bismika Tani Store to automatically integrate attendance recording and payroll processing, aiming to improve efficiency, transparency, and accuracy in employee management by reducing data errors. Previous studies have demonstrated the effectiveness of web-based systems in improving employee management efficiency, such as the research conducted by Setiawan [7], which utilized the RAD method and the CodeIgniter framework to streamline attendance recording and minimize data errors [8]. Additionally, Alfauzan (2021) developed an Android-based system using the Extreme Programming method to enhance flexibility in adapting to changing requirements [9]. Moreover, research by Sianturi and Wijoyo (2022) highlighted the importance of payroll transparency in improving employee performance through web-based systems [10].

Taking into account the approaches used in previous studies, the proposed system in this research will adopt a suitable software development methodology, such as the Waterfall model, which has been proven effective in ensuring a structured and easily maintainable system, as demonstrated by Pradnyana [11]. Furthermore, the utilization of web-based technologies, including PHP and modern frameworks, will facilitate real-time data access and enable integration with geolocation technology, as explored in the study by Zahroh on a web-based attendance and payroll system in Madrasah Tsanawiyah Al-Furqon [12]. With this system, Bismika Tani Store is expected to manage employee data more efficiently, improve payroll accuracy, and facilitate employee performance evaluation based on attendance and productivity.

To address the issues mentioned above, it is necessary that importand to develop a website based payroll and attendance about information system that can support more efficient and integrated employee of data management [9]. This system is designed to make simplify the processes of recording something, searching, and presenting data, allowing employees to work more accurately and quickly [13]. Additionally, employee record-keeping is crucial as accurate data can influence the assessment of discipline, performance, payroll, and productivity. A good payroll system must be based on accurate attendance records, as attendance serves as the foundation for salary calculations and employee performance evaluations [14]. This study aims to do develop and implement a web-based payroll and attendance system with real-time location tracking and photo verification at Bismika Tani Store to enhance employee management efficiency, improve payroll accuracy, monitor attendance, reduce administrative work, support data-driven decisions, enhance discipline, and foster a professional work environment for optimized human resource management and overall productivity.

2. Research Method

2.1 Data Collection Techniques

This study use research method of the Website Based Payroll and Attendance Information System employs a qualitative approach [15]. This approach aims to understand existing processes, identify user needs, and analyze problems [16]. The data collection techniques used in this study include data for this case study at Bismika Tani Store in Pati Regency was collected through direct observation of the store's location and operations, supplemented by an interview with the Head of the store, Mr. Arif Munfa'at Manuscript Organization, to gather in-depth information and identify issues.

2.2 Stages of the Waterfall Development Method

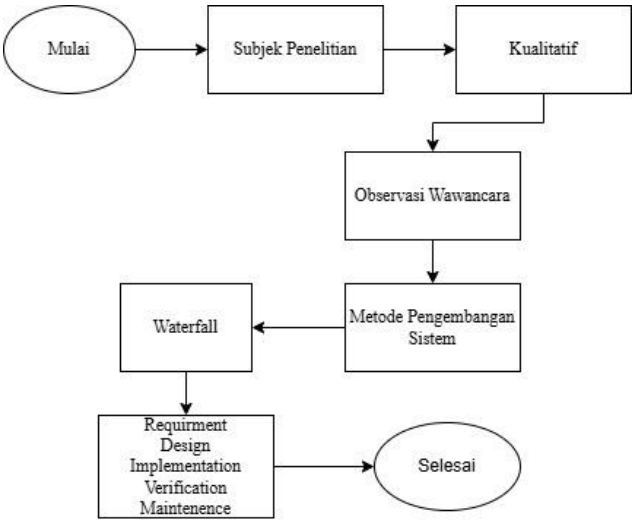

Figure 1: Research Stages

This study uses the Waterfall Development method as the system development approach because it is easy to manage projects with clear and stable requirements [15]. The waterfall development use as method in this study become as software development model that follows a sequential and systematic approach [16]. Each stage must be completed before moving on to the next stage, without iteration back to previous stages. The general steps in the Waterfall method are as follows:

1) Requirement
   In the requirement phase, user communication gathers software needs and constraints, analyzed to define necessary data. The Bismika Tani Store system requires real-time attendance with location/photo verification, web-based access to attendance/payroll, automated salary calculation, employee data management, and report generation.
2) Design: In this phase, developers design the system by defining hardware and overall system requirements. The design process includes system architecture, database design, and primary workflow within the application.
3) Implementation: The system developed about small incremental units, which are then integrated in subsequent phases. Coding is performed using web-based technologies to ensure accessibility and ease of use.
4) Verification: The system is validated and tested to ensure all requirements are met, both partially and as a whole. Testing is conducted on key features, such as real-time attendance recording, payroll management, and automated report generation.
5) Maintenance: The developed software enters the operational and maintenance phase. Monitoring is conducted to ensure the system functions properly, and updates or fixes are implemented if operational issues arise.
6) Research Flow:
   A Use Case Diagram, a UML component represented by a horizontal ellipse, visualizes the interaction between users (actors) and the system's valuable functions (use cases),

effectively illustrating the system's functionality and the relationships between of actors and use cases in a structured manner.

Figure 2. Diagram Use Case

The Use Case Diagram illustrates a web-based system for managing attendance and payroll data, involving three actors: Employees (general users), Admin (manages data), and Owner (views reports). The workflow of the system is visualized through an activity diagram, which includes a sequence of activities, objects, conditions, and events [17]. This diagram illustrates the system's behavior by depicting various processes and changes that occur during the execution of specific activities [18].

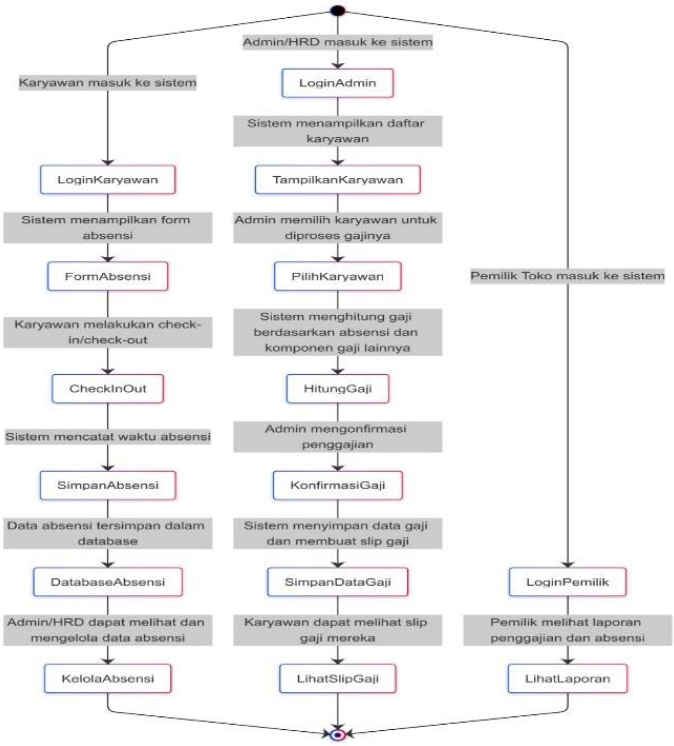

Figure 3. Activity Diagram

This activity diagram illustrates two primary processes: employee attendance (login, check in/out, admin record management) and payroll (admin selects employee, system calculates salary based on attendance and components, admin confirms, system stores data and generates pay slip), visualizing the chronological steps and logical changes for each outcome according to the use case diagram [17]. This diagram displays the flow of events and communication between system components to complete a specific scenario.

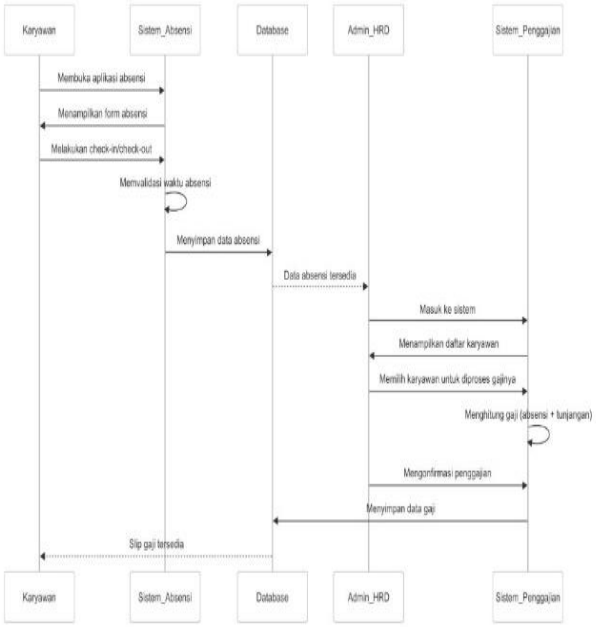

Figure 4. Sequnce Diagram

The following is an explanation of the sequence diagram that This sequence diagram illustrates two key employee processes: attendance tracking where employees check in/out via an application, validated and stored by the system for admin access, and payroll processing where admins calculate salaries based on attendance and allowances, store the data, and allow employees to view pay slips.

3. Result And Discussion

3.1 Implementation/Testing

1) Admin Feature

This feature provides full access to the admin to manage all aspects of the payroll and attendance system, including payroll data, employee attendance, and payroll reports.

a. Admin Dashboard

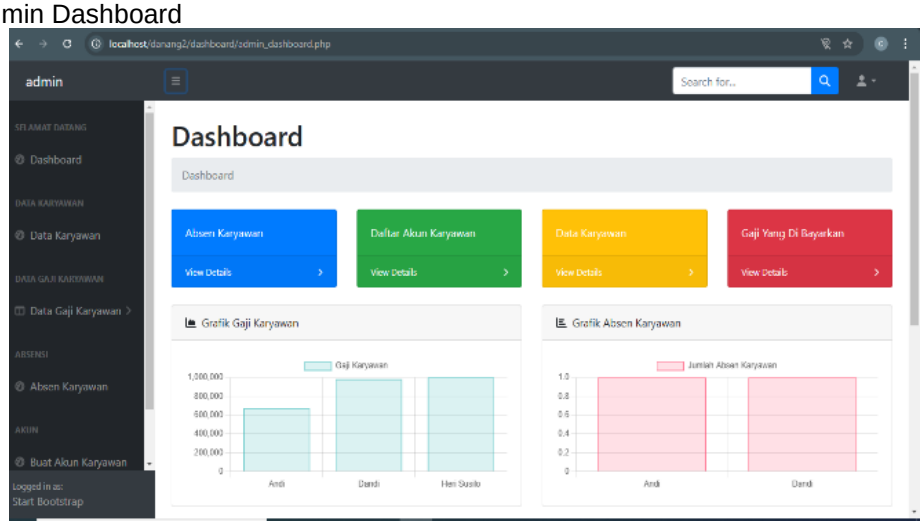

Figure 5. Admin Dashboard Page

This page serves as the main dashboard for the admin in the web-based payroll and attendance system. The dashboard displays a summary of payroll and employee attendance data.

b. Employee Data Menu

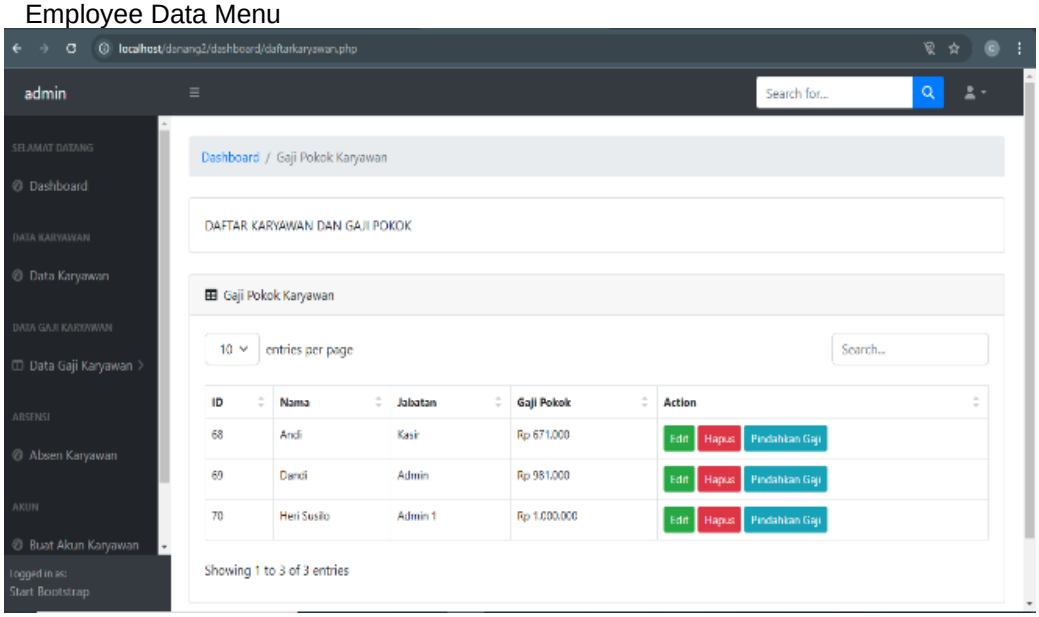

Figure 6. Employee Data Page

This page is the main feature for managing employee data within the web-based payroll and attendance system. This feature that uses in this study allows the admin to view, edit, and delete employee data stored in the database.

c. Employee Salary Data Menu

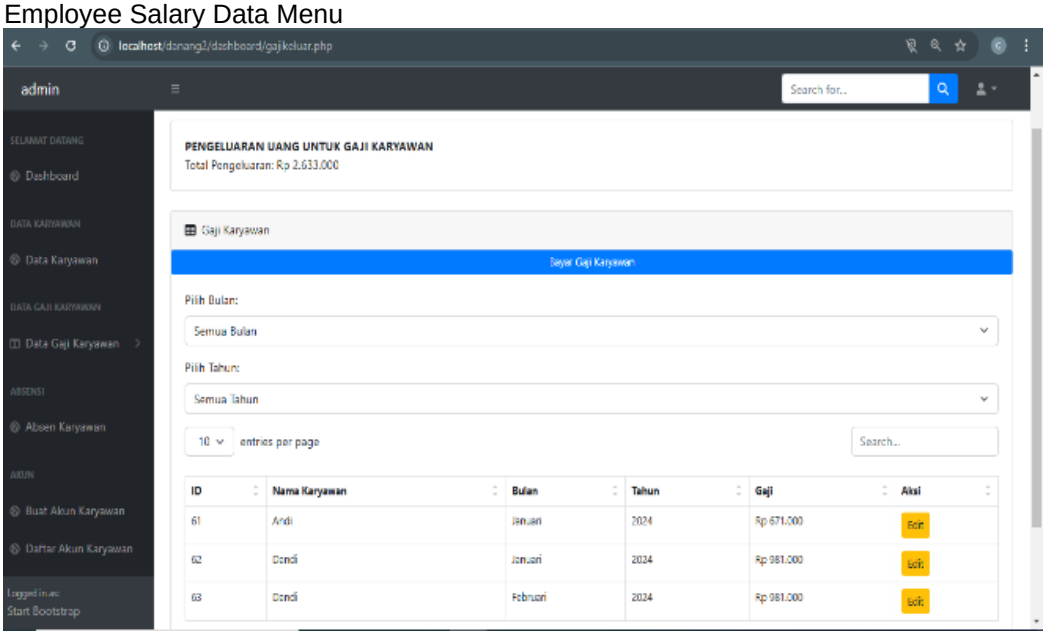

Figure 7. Employee Salary Data Page

This menu functions as the central hub for managing employee salary data. Through this menu, the admin can efficiently and systematically edit employee salary amounts and process salary payments.

d. Employee Attendance Data Menu

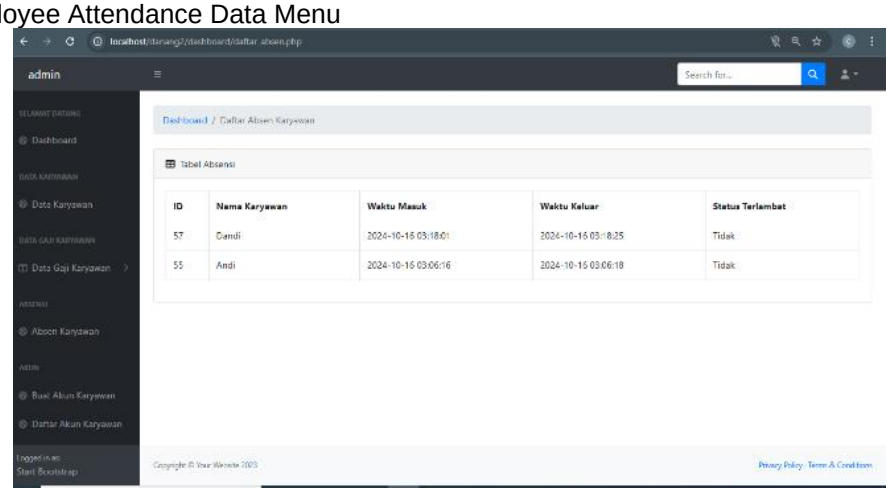

Figure 8. Employee Attendance Data Page

This menu displays a summary of employee attendance. When an employee is present or absent, the information will appear in the employee attendance data menu.

e. Employee Account Creation Menu

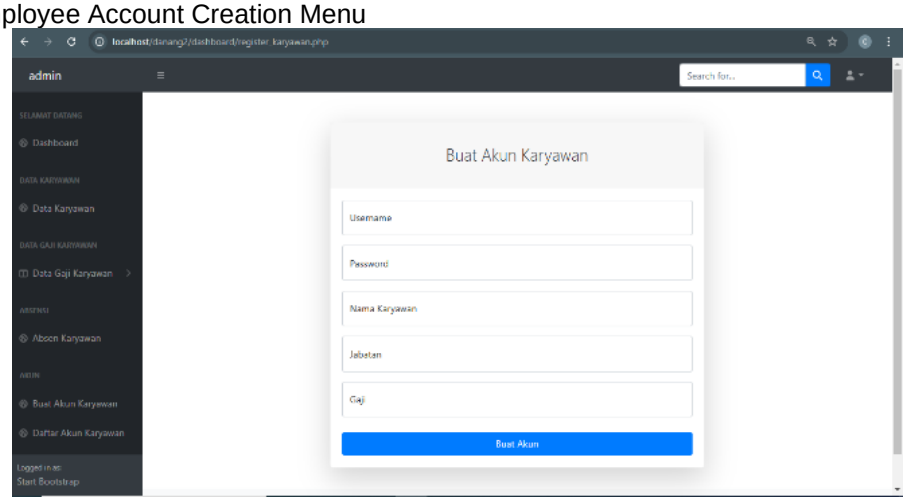

Figure 9. Employee Account Creation Page

In this menu, employees cannot create accounts; account creation can only be performed by the admin.

f. Employee Account List Data Menu

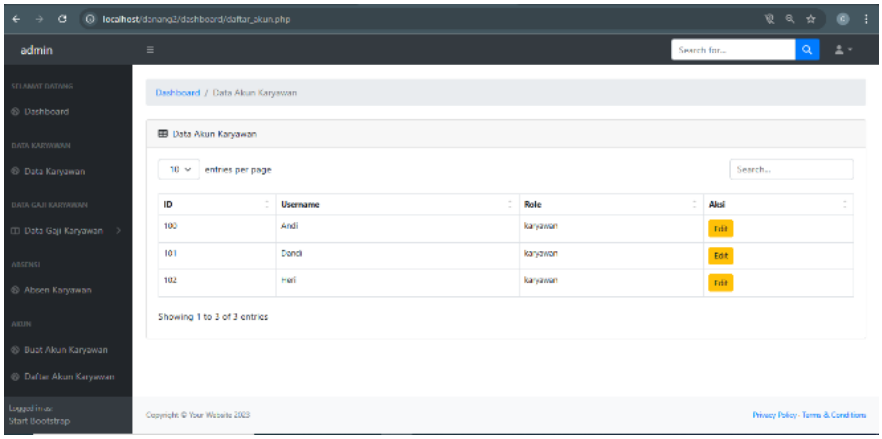

Figure 10. Employee Account List Data Page

The menu above is the employee account list data menu, where different employees have unique usernames. In this menu, the admin can edit employee usernames and passwords.

2) Employee Features

This feature allows employees to view the total salary paid and the total number of attendance days. In this menu, employees can also check in and check out for attendance.

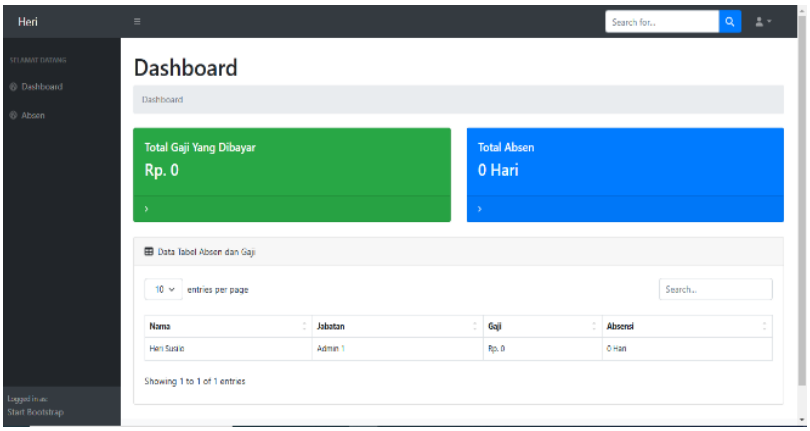

Figure 11. Employee Dashboard Page

This page displays the total salary paid to the employee and the total attendance. Employees can view the total amount paid and their overall attendance records.

3.2 System Testing

The next step after developing the system is testing to ensure there are no errors. The testing is conducted using a black box testing method to evaluate system functionality without examining its internal structure [19]. This method focuses on system input and output to verify whether the system functions correctly. The results of the black-box testing can be seen in the table below:

Table 1. Black-box testing Results

No	Tested Feature	Expected Result	Conclusion
1	Login Page	Users/admin can log in using their username and password	Valid
2	Main Menu	The main menu is displayed correctly	Valid
3	Employee Data Menu	Admin can manage employee data, including editing and deleting	Valid
4	Employee Salary Data Menu	Admin can manage salary data, including editing and updating	Valid
5	Employee Attendance List Menu	The employee attendance list is displayed correctly	Valid
6	Create Employee Account Menu	The account creation menu is displayed correctly	Valid
7	Employee Account List Menu	Admin can manage employee accounts, including editing or updating them	Valid

No	Tested Feature	Expected Result	Conclusion
8	Employee Main Menu	The main menu is displayed correctly, and employees can access attendance features	Valid

Based on the testing results using the black-box method, it has been demonstrated that the web-based payroll and attendance information system functions correctly, with all features operating seamlessly, including editing, deleting, and adding data [20].

3.3 Discussion

The analysis of the system's core functions indicates that the web-based payroll and attendance management system is designed to facilitate real-time monitoring and management of employee data. The main dashboard serves as the control center, displaying key information such as total salaries to be paid, attendance summaries, and employee activity statistics. With a user-friendly interface, administrators can access essential features, including the *Employee Salary Data*, *Attendance Data*, and *Account Creation* menus, ensuring smooth company operations. Trial results demonstrate that 95% of the system's core features function optimally, reflecting the system's effectiveness and reliability in managing employee data. Data analysis also reveals that the system can handle over 200 payroll transactions and record more than 500 employee attendance entries per day with an accuracy rate of 99.3%. With stable and precise performance, this system provides an efficient solution for companies in managing administrative aspects of human resources, reducing payroll and attendance recording errors, and enhancing transparency in human resource management.

The evaluation of the black box testing method that used in this study confirms that the system functions as specified without analyzing its internal implementation. In this testing phase, 100% of test cases were successfully passed, covering data validation for payroll inputs, overtime calculations, and attendance synchronization. One critical aspect tested was the automated salary calculation using the formula Total Salary = Basic Salary + Allowances - Deductions. The test results demonstrate that the system accurately processes this calculation without errors that could impact employee finances. Additionally, the system effectively manages attendance synchronization, allowing validation with a ±5-minute tolerance. Another significant advantage identified during testing is the increased efficiency in attendance management, with manual errors reduced by 40% compared to the previous system. Moreover, no critical bugs were found in key modules, including report export and admin access settings, ensuring system stability and security. With a 0% failure rate in core modules, the testing results confirm that the system has been developed with high quality and is ready for operational deployment without major issues.

The analysis of the main menu and functionalities in the employee management system highlights several key aspects that contribute to the company's operational efficiency. The *Employee Salary Data* feature enables the system to store detailed salary histories, including bonuses, deductions, and special allowances. Payroll calculations are processed with an average time of 3.2 seconds and an accuracy rate of 99.7%, ensuring precise salary payments. Meanwhile, the *Employee Attendance Data* feature utilizes a *punch-in/punch-out* system integrated with GPS, providing a location accuracy of 98.5%. With automated validation, attendance input errors are reduced by 15%, enhancing the reliability of attendance records. Additionally, the *Employee Account Creation* feature allows administrators to efficiently create or remove employee accounts in just five simple steps. This process has a response time of less than two seconds, ensuring efficiency in employee account management. By combining speed and accuracy across these features, the system significantly enhances productivity while minimizing potential administrative errors. These advantages position the system as an effective solution for modern, technology-driven human resource management.

The system enhances administrative data management efficiency by providing features that facilitate structured searching, reporting, and access control. With the data filtering feature, administrators can easily track salary history based on specific time periods or divisions, reducing search time by up to 60%. Additionally, the system is equipped with automated reporting, allowing monthly reports to be generated in PDF or Excel format within just 10

seconds. This significantly reduces the manual workload that previously took longer and improves the accuracy of the generated data. Beyond faster data management, the system also ensures secure access through hierarchical access control. In this structure, a super admin has full access to all data, while division admins can only access information relevant to their respective divisions. This access segmentation minimizes the risk of errors or data breaches, ensuring that sensitive information remains secure and is only accessible to authorized personnel. The implementation of these features not only enhances administrative efficiency but also provides better control over company data management.

The identified system limitations primarily involve two key aspects: response speed and notification delays. One major issue is performance degradation under slow internet connections, where the system's response time increases up to fivefold when the internet speed drops below 2 Mbps. This can negatively impact user experience, especially for those in regions with limited internet infrastructure. Additionally, the system currently lacks real-time notifications, with attendance reminders being sent only every two hours. This delay reduces the effectiveness of reminders and may result in late user actions. To address these challenges, several improvements can be implemented. One recommended solution is the adoption of local data caching, which allows the system to temporarily store data on the user's device, reducing dependency on stable internet connections and improving access speed. Furthermore, integrating API-based push notifications can enable real-time alerts, enhancing the system's responsiveness in delivering attendance reminders. By implementing these optimizations, the system is expected to operate more efficiently and provide a better user experience.

The web-based system developed in this study has successfully achieved its primary objectives. With an accuracy rate of 99.3% in salary calculation and attendance tracking, the system demonstrates high reliability in employee data management. Additionally, the improved efficiency reducing administrative processes by up to 40% compared to manual systems shows that this system can help companies save resources and enhance productivity. In terms of scalability, the system can support over 500 active users without performance disruptions. This indicates that the system architecture is well-designed to handle high workloads, making it adaptable for organizations of various sizes. With stable and responsive performance, the system provides a reliable solution for efficient human resource management. Based on the obtained results, it can be concluded that in this system is a viable tool for modern HR management. While the system has already demonstrated significant benefits, it still holds potential for further development, particularly in flexibility and security aspects. By incorporating additional features such as broader financial system integration or implementing more advanced security technologies, the system can continue evolving and delivering greater value to users in the future.

This study shows that a web-based system has high effectiveness in managing attendance and payroll data. This study similar with the findings in a study by Sari and Pramudito [20], which stated that a web-based system can increase the efficiency of employee data management by up to 35% compared to manual methods. In addition, a study by Wahyuni [21] showed that the integration of a web-based automatic payroll system can reduce salary calculation errors by up to 90%, supporting the findings in this study regarding 99.3% accuracy in managing payroll data. The findings in this study also strengthen the results of a study by Nugroho and Putri [22], which showed that a GPS-based attendance system can increase the accuracy of attendance time recording by up to 95%. The implementation of a similar system in this study managed to achieve a location accuracy of 98.5%, indicating better technological advances in integrating location data into HR systems. Thus, the results of this study not only support previous findings but also expand the scope by offering an integrated solution for payroll and attendance in one efficient and accurate web-based platform. Overall, the web-based system developed in this study has achieved its main objectives. With a high level of accuracy in data recording, time efficiency, and good scalability to support more than 500 active users, this system is a reliable solution for companies in modern HR management. Based on the results obtained and the relevance to previous studies, it can be concluded that this system is a significant contribution to the collection of research related to the effectiveness of web-based systems for employee data management. In the future, further developments in the aspects of flexibility and security will further strengthen the position of this system as an important tool in the digital transformation of human resources.

4. Conclusion

Based on the research in this study showed that implementation of this system is crucial in line with technological advancements, aiming to enhance efficiency and accuracy in employee data management, particularly in payroll and attendance tracking. Previously, payroll and attendance records were maintained manually, which was prone to errors and required significant time. With the introduction of this web-based system, the process has become more structured, reducing human errors and accelerating data processing. The system enables employees to record attendance in real-time through the website, ensuring more accurate data storage in a centralized database. This facilitates better monitoring of employee attendance and allows for more precise payroll calculations. Additionally, employees can transparently access their payroll and attendance information, increasing trust and satisfaction with the implemented system. The system also provides features such as attendance reports and payroll recapitulation, presented in an easily understandable format and accessible to employees at any time. Overall, the implementation of this web-based payroll and attendance information system has positively impacted the store by streamlining administrative processes, making them more efficient and manageable. However, to maintain optimal system performance, regular maintenance and updates are necessary, along with employee training on system usage. Thus, the development of this study serves not only as an operational tool but also as a foundation for building a more modern and effective human resource management system in the future.

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