

Design and Development of a Web-Based Employee Attendance and Payroll Information System at CV Expressa

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Abstract— This study aims to design and develop a web-based employee attendance and payroll information system for CV Expressa to overcome challenges associated with manual processes, including delayed salary payments, inaccurate data recapitulation, and lack of transparency. The method used is the waterfall model System Development Life Cycle (SDLC) approach, which includes needs analysis, system design, implementation using the Laravel framework and MySQL database, blackbox testing, and maintenance. The results show that the system is able to automate GPS-based attendance recording and salary calculations, accelerate data recapitulation, and provide independent payslip access for employees. This system also successfully improves operational efficiency and data accuracy, as well as reducing administrative workload. Based on the company's internal audit logs, quantitative evaluation revealed a significant improvement: payroll processing time was reduced from an average of 5 hours to approximately 30 minutes per cycle, while the input error rate dropped from 17% to just 2%.

Keywords— attendance, payroll, SDLC, information systems, web

I. INTRODUCTION

Two important aspects of human resource management that directly affect employee welfare and discipline are attendance and payroll. These procedures are still done manually at CV Expressa using Microsoft Excel for data recapitulation and text messages for attendance reporting. Various problems have been identified in the manual process, including potential errors in data recording and calculation, delays in salary distribution, and difficulties in verifying employee attendance. As the workforce increases and working hours change, these problems become more complicated. Slow historical data searches are another consequence of non-integrated internal systems, especially when needed for audits or annual reporting.

One contributing factor to the lack of an adequate internal support system is the company's primary focus on external project development. In fact, an integrated information system can speed up decision making[1], reduce data processing, and increase administrative efficiency[2][3]. The accuracy and transparency of attendance recording and salary payments are also expected to be supported by a web-based payroll and attendance information system[4][5][6].

This study aims to design and build a web-based employee attendance and payroll information system at CV Expressa. This system is designed to be able to automate attendance recording and salary calculations,

reduce manual input errors, and speed up the data recapitulation process. The method used in system development is the System Development Life Cycle (SDLC) waterfall model approach, with stages of needs analysis, design, implementation, testing, and maintenance[7][8][9].

The primary contribution of this research is the development of an integrated information system that enhances the accuracy and efficiency of attendance and payroll processes. This system is intended as a guide to digital HR management, especially for medium-sized businesses that still use manual systems[10][11][12][13][14].

II. METHODS

A. Data Collection Method

The data collection in this study was carried out through three main techniques:

1. **Observation**
Direct observation was carried out at CV Expressa to review the employee data management process, especially those related to attendance and payroll.
2. **Interview**
An in-depth interview was conducted with the company's manager, Mr. Aditya Erda Syahril, to explore the limitations of the existing system and identify functional requirements for the new system.
3. **Literature Study**
Literature from books, journals, and scientific works is used as a theoretical basis and support in system design.

B. System Development Method

System development uses the System Development Life Cycle (SDLC) waterfall model approach which consists of five stages:

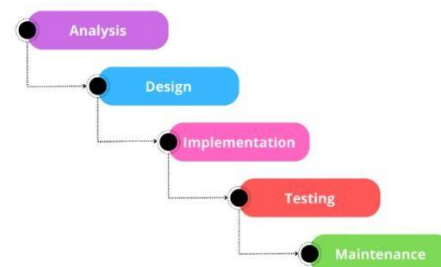


Fig 1. SDLC Waterfall Model Stages

1. Analysis
Requirements analysis was conducted using the PIECES method to identify weaknesses in the old system and detail the needs of the new system.
2. Design
System design includes creating Entity Relationship Diagrams (ERD), Data Flow Diagrams (DFD).
3. Implementation
The system interface was developed using the Laravel framework and PHP programming language, with a focus on user-friendliness and responsive design. The database used is MySQL, and the development process is carried out using the Visual Studio Code editor.
4. Testing
The system was evaluated using the Blackbox Testing method to verify that each feature functions in accordance with its specified requirements.
5. Maintenance
After the system is running, continuous monitoring and improvement are carried out, including adjustments to new regulations or needs.

	manage attendance and salaries.	operational costs can be reduced.
Control	No attendance time validation. Employees can send attendance chats at any time, and admins cannot verify attendance accurately.	The system only accepts attendance if it is done at the specified time and from the correct location (GPS). Admins can audit attendance and there is a system log for each activity.
Efficiency	Attendance data must be manually inputted into Excel, then reprocessed for payroll. Very inefficient and prone to copy-paste errors.	All data is integrated: attendance - recap - salary - report. There is no double input, and the automatic process avoids calculation errors.
Service	Employees must ask the admin directly if they want to know the number of attendance or salary. Pay slips are distributed manually.	The system provides a dashboard for each employee to see attendance data, salary amount, and pay slips automatically. Information can be accessed at any time without relying on the admin.

III. RESULTS AND DISCUSSION

A. Analysis Stage

In the PIECES approach (Performance, Information, Economy, Control, Efficiency, and Service) is used to see the current system. The analysis is intended to find weaknesses in the system so that it can be used as a basis for designing a better system.

Table 1. PIECES Analysis

Components	Old System	New System
Performance	The attendance process is done via WhatsApp chat every day, so the admin has to manually summarize one by one. The calculation of monthly salaries is done by looking at each data in Excel, which is time-consuming and prone to being mixed up.	Automated attendance system using GPS-based check-in features and server time. Attendance data is directly recorded in the system, and salary calculations are carried out automatically according to the recapitulation of attendance data and overtime/deduction provisions.
Information	Attendance data is spread across WhatsApp chats, difficult to track back for recap. Payroll data in Excel has no change history and cannot be viewed directly by employees.	The system stores all attendance and salary data in a structured database, complete with activity history. Employees can view attendance history and pay slips through the system interface.
Economy	A lot of time is wasted on manually summarizing attendance data and calculating salaries. The process requires at least 1 full-time admin staff to	The system significantly reduces the need for administrative personnel due to its automated processes. Time efficiency reduces the workload and

B. Design Stage

At the design stage, process design is carried out using Data Flow Diagrams (DFD) to describe the data flow in the system, as well as database design using Entity Relationship Diagrams (ERD) to model the structure and data relationships required by the system.

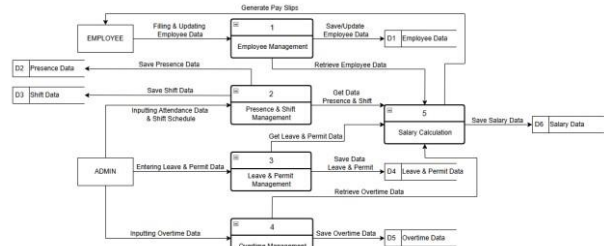


Fig 2. DFD Level 0

This Level 0 DFD describes the main data flow and processes in the information system that includes employee attendance and payroll, with two external entities, namely Employees and Admin. Main Processes:

1. Employee Management (Process 1)
Employees can fill in and update their personal data. This data will be saved or updated into Employee Data (D1).
2. Presence & Shift Management (Process 2)
Admin is responsible for inputting employee attendance and shift schedule data. This data is saved into Presence Data (D2) and Shift Data (D3).
3. Leave & Permit Management (Process 3)
Admin also manages leave and permit data, which is then saved into Leave & Permit Data (D4).
4. Overtime Management (Process 4)

Admin records employee overtime data, then saves it into Overtime Data (D5).

5. Salary Calculation (Process 5)

The system takes data from processes 1–4 (employees, attendance & shifts, leave & permits, overtime) to calculate employee salaries. The results are saved to Salary Data (D6) and generate a Salary Slip.

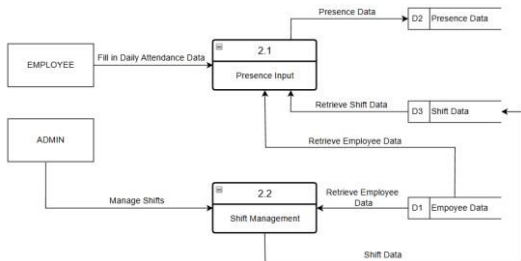


Fig 3. DFD Level 1 Attendance & Shift Management

This level 1 DFD describes the Attendance & Shift Management process into two main sub-processes, namely:

1. Process 2.1 – Attendance Input
Employees fill in daily attendance data. The system saves the data to Attendance Data (D2) and takes references from Shift Data (D3) and Employee Data (D1).
2. Process 2.2 – Shift Management
Admin manages employee shift schedules. The set shift data is saved to Shift Data (D3), by taking data from Employee Data (D1).



Fig 4. DFD Level 1 Leave & Permit Management

This Level 1 DFD details the Leave & Permit Management process into four subprocesses:

1. Process 3.1 – Leave Data Input
Employees apply for leave, the data is saved to Leave & Permit Data (D4) after taking reference from Employee Data (D1).
2. Process 3.2 – Leave Verification
Admin verifies the leave, then the system updates the leave status in Leave & Permit Data (D4).
3. Process 3.3 – Permit Data Input
Employees apply for leave, and the data is saved to Leave & Permit Data (D4) with reference from Employee Data (D1).
4. Process 3.4 – Permit Verification
Admin verifies the permission, and the system updates the permission status in Leave & Permit Data (D4).

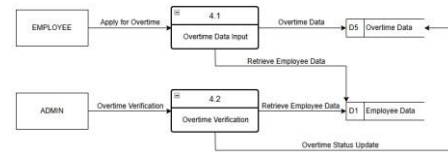


Fig 5. DFD Level 1 Overtime Management

This level 1 DFD explains the process of managing employee overtime in two main subprocesses:

1. Process 4.1 – Overtime Data Input
Employees submit overtime requests. The system saves the overtime data to Overtime Data (D5) with reference to Employee Data (D1).
2. Process 4.2 – Overtime Verification
Admin verifies the overtime request, then the system updates the overtime status in Overtime Data (D5) based on employee data from D1.

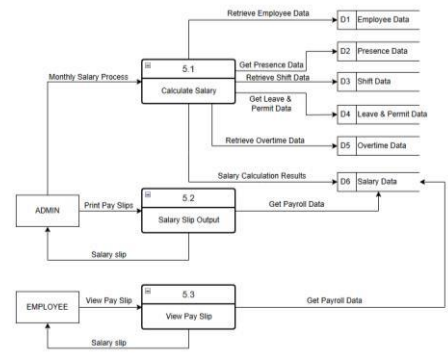


Fig 6. DFD Level 2 Payroll Process

This level 2 DFD describes the payroll process where the calculation and printing of monthly pay slips goes through three main subprocesses:

1. Process 5.1 – Calculate Salary
Admin starts the monthly payroll process. The system calculates salary based on data from Employee Data (D1), Attendance Data (D2), Shift Data (D3), Leave & Permit Data (D4), Overtime Data (D5) then the results are stored in Salary Data (D6).
2. Process 5.2 – Output Pay Slip
The system takes data from Salary Data (D6) and prints a pay slip for the admin.
3. Process 5.3 – View Pay Slip
Employees can view their pay slips from data taken from Salary Data (D6).

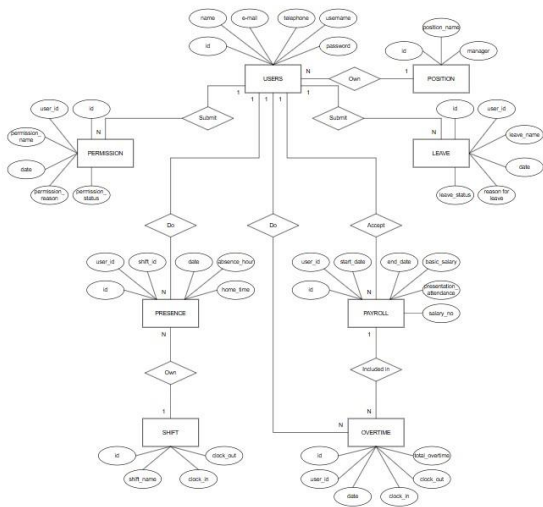


Fig 7. ERD

The Entity Relationship Diagram (ERD) of the employee attendance and payroll information system illustrates the relationship between data that supports the attendance and payroll administration process. The main entity in this system is Users, which is connected to Position, Presence, Leave, Permit, Overtime, and Payroll. Each employee has position data and work shift schedules recorded in Presence. For absences, the Permit and Leave entities are used, while additional working hours are recorded in Overtime. All of this data will be processed in the Payroll entity to automatically generate salary calculations. Not all attributes in the ERD are explained in detail, because this explanation only highlights the main attributes to keep the focus and summary efficient.

C. Implementation Stage

1. Login Page

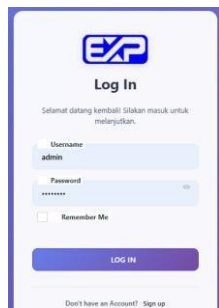


Fig 8. Login Page

The login page is used for user authentication, ensuring that only registered users can access the system. Username and password input will be verified to the database before redirecting to the main dashboard.

2. Dashboard Page

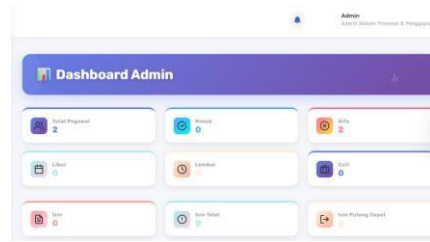


Fig 9. Dashboard Page

The dashboard page is used to display a summary of employee attendance data in real-time, such as the number of employees, absences (in, alpha, permission, leave, etc.), so that the admin can monitor and make decisions quickly.

3. Employee Data Page

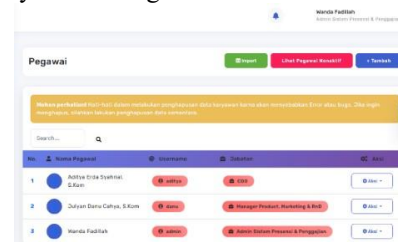


Fig 10. Employee Data Page

The employee data page is used to manage active employee information, including adding, editing, deleting, and viewing details such as name, username, and position. Search, data import, and inactive employee filter features are also available to simplify administration.

4. Presence Page

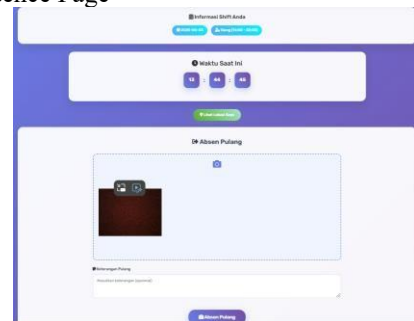


Fig 11. Presence Page

The attendance page is used to record employee attendance in real-time with photo verification, description, and location according to the specified shift schedule.

5. Attendance Recap Page

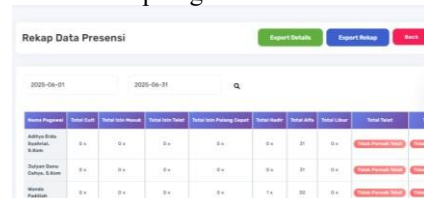


Fig 12. Attendance Recap Page

The attendance summary page is used to display a summary of employee attendance within a certain time range, including leave, permits, attendance, alpha,

overtime, and attendance percentage. Equipped with salary input features, download absences, and export data.

6. Payroll Page

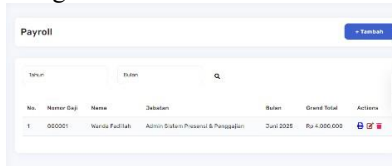


Fig 13. Payroll Page

The payroll page is used to record, view, edit, and print employee salary data based on a specific month and year, complete with total nominal and job details.

7. Print Pay Slips

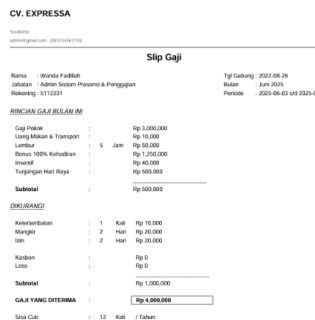


Fig 14. Print Pay Slips

The pay slip print page is used to generate a detailed document of employee salary, including income components, deductions, total salary received, and remaining leave, in a print-ready format.

D. Testing Stage

System testing is carried out using the blackbox method to ensure that each function runs according to user needs.

Table 2. Login Page Testing

Test Cast	Input	Expetect Output	Status
Login with valid data	Username & Password is correct	Login to dashboard	Succeed
Username & password are empty	All empty	Error message for both fields	Succeed
Wrong Username/Passwor d	Wrong Data	Message "Wrong Username/Passwo rd"	Succeed

Table 3. Employee Data Page Testing

Test Cast	Input	Expetect Output	Status
Add employee data	Fill all fields & save	Data is saved and appears in the table	Succeed
Edit employee data	Change data & save	Updated employee data	Succeed
Delete data	Click the delete button	Data is deleted from the table	Succeed
Search data	Fill in the search field	Appropriate data appears	Succeed
Add without mandatory content	Leave important fields blank	A validation error message appears	Succeed

Table 4. Presence Page Testing

Test Cast	Input	Expetect Output	Status
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Successful Clock-In	Click "Clock In" with photo, active shift, valid location	Clock-in data is saved, form changes to "Clock Out"	Succeed
Successful Clock-Out	Click "Clock Out" after clocking in	Clock-out data is saved, form is disabled or hidden	Succeed
Clock-in without GPS	Location cannot be detected	Validation fails, message "location not found" appears	Succeed
Optional note filled	Fill in the description field	Note is saved with attendance data	Succeed
Optional note empty	Leave description field empty	Clock-in still successful (field is optional)	Succeed
Button changes automatically	After clicking "Clock In"	Button changes to "Clock Out" without reload	Succeed

Table 5. Attendance Recap Page Testing

Test Cast	Input	Expetect Output	Status
Select valid date range	Start and end dates are valid	Recap data is displayed	Succeed
Select invalid date	Invalid date (e.g., June 31st)	Validation fails or error	Succeed
Click "Export Recap" button	Click the button	Recap file is downloaded	Succeed
Click "Export Detail" button	Click the button	Detailed file is downloaded	Succeed
Access "Input Salary" action	Click the button	Salary input form appears	Succeed
Access "Download Attendance" action	Click the button	Attendance file is downloaded	Succeed

Table 6. Payroll Page Testing

Test Cast	Input	Expetect Output	Status
Add salary record	Fill in all fields & save	Salary data appears in the table	Succeed
Edit salary	Modify values & save	Updated values are shown	Succeed
Delete salary	Click delete icon	Data is removed from the table	Succeed
Filter salary data	Select month & year	Table displays filtered data	Succeed
Print payslip	Click print icon	Payslip preview or print screen opens	Succeed

E. Maintenance Stage

The purpose of the maintenance stage is to ensure that the employee attendance and payroll information system continues to operate properly without errors or disruptions. System maintenance is essential to adapt to changing user needs, fix bugs, and ensure compatibility with evolving technology. The maintenance process involves several key activities:

1. Application Maintenance

- a. Performing updates or bug fixes when errors are found during system operation.
- b. Adjusting the application if there are changes in user requirements or company policies.
- c. Conducting retesting after updates to ensure that no new issues are introduced.

2. Hardware Maintenance

- a. Performing regular checks on servers, client devices, and network equipment to ensure they function correctly.

- b. Cleaning hardware and maintaining proper temperatures to prevent overheating and damage.
 - c. Upgrading hardware components when needed to support system performance.
3. Database Maintenance
- a. Conducting routine data backups to prevent data loss caused by system failure or security breaches.
 - b. Optimizing the database through indexing, removing duplicates, and cleaning up unused records to maintain performance.
 - c. Securing data with appropriate access controls and protection against unauthorized access.

F. Evaluation of Implementation Results

1. Quantitative Evaluation

To measure the system's impact on efficiency and accuracy, a comparative analysis was conducted. Prior to implementation, the payroll and attendance recapitulation process took up to five hours per period and involved one full-time administrative staff member. After the new system was implemented, the process time was reduced to approximately 30 minutes, and the administrative workload decreased significantly. The error rate in payroll calculations decreased from an average of 17% (due to manual input and spreadsheet inconsistencies) to just 2%, based on audit results and system logs.

These time and error rate estimates were obtained from direct interviews with company managers, based on operational experience before and after the system's implementation. While this data does not come from statistically measurable experiments, the information obtained is sufficient to quantitatively illustrate the increase in productivity and efficiency within the context of the system's implementation at the company.

2. Security Aspects

The system incorporates comprehensive data security features. Considering that GPS spoofing is a common vulnerability in location-based systems, several security mechanisms have been implemented. To address this, the application validates location coordinates against server time and rejects attendance from areas outside predetermined zones (geofencing). Furthermore, sensitive payroll data is encrypted in a MySQL database and protected through role-based access control (RBAC). Only authorized personnel can access payroll data, and all user activity is logged to maintain accountability.

3. Technical Challenges and Discussions

The implementation phase faced several challenges. One notable issue was signal instability, which affected GPS accuracy in enclosed areas, causing some attendance records to fail. To mitigate this issue, a tolerance radius was implemented along with a caching mechanism to store temporary location data during signal loss to temporarily store location data when the signal was lost. Second, Laravel's integration

with a large attendance dataset caused delays in report loading. Optimizations were made by implementing pagination and query indexing on the attendance table.

4. Novelty and Contribution

Compared to previous research, this system integrates several innovations, including: (1) Real-time GPS-based attendance validation; (2) Automatic salary calculation based on overtime and leave data; and (3) Self-service access to view payslips. Unlike other systems that focus solely on attendance or payroll separately, this platform offers comprehensive integration. The simplicity of the design and minimal infrastructure requirements make this system suitable for companies transitioning from manual to digital systems.

IV. CONCLUSION

This study aims to design and build a web-based employee attendance and payroll information system at CV Expressa. Based on the results of the analysis and implementation using the System Development Life Cycle (SDLC) waterfall model, the system built is able to overcome various problems that previously arose due to manual administration processes, such as data inaccuracy, payroll delays, and difficulties in tracking and recapitulating attendance information.

The developed system enhances efficiency and accuracy in managing attendance and payroll by integrating automated data processing, validating attendance using GPS, and providing employees with direct access to digital payslips. In addition, this system also reduces administrative workload and supports information transparency for all related parties.

Quantitative productivity evaluations show significant improvements in both work time efficiency and reduced administrative errors. The inclusion of basic security features such as GPS validation and role-based access control also addresses concerns about data integrity and potential location manipulation. The novelty of this system lies in its integrative and user-centric design, which is specifically aligned with the organizational workflow and operational requirements of the company.

A limitation of this study is the narrow scope of implementation, which is currently restricted to a single company, thereby limiting the generalizability of the findings, as well as the unavailability of advanced features such as mobile device integration, use of biometric authentication, and a more complex data security system. Therefore, the results of this study still have room for further development.

As a recommendation, Future developments should consider integrating mobile application capabilities to enhance user accessibility and interaction, improved security systems based on multi-factor authentication, and integration of performance evaluation modules based on attendance data. Further research can also explore the application of similar systems in other industrial sectors to test the scalability and flexibility of the developed system.

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