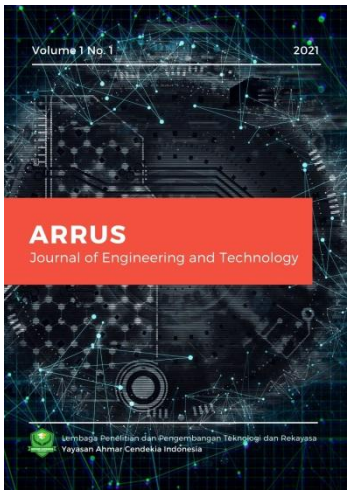
https://doi.org/10.35877/jetech4173

OPEN ACCESS

ISSN : 2776-7914 (Print) / 2807-3045 (Online)



RESEARCH ARTICLE

Design of A Web-Based Teacher Payroll Information System Using CodeIgniter 4 Framework at MTs Ma'arif 30 Sumber Rejeki Mataram, Lampung

Shella Nitami*, Sigit Auliana, & Basuki Rakhim Setya Permana

Department of Computer Science, Faculty of Computer Science, Bina Bangsa University, Serang City, Indonesia.

*Corresponding author: Shella Nitami, Department of Computer Science, Faculty of Computer Science, Bina Bangsa University, Serang City, Indonesia

E-mail: shellanitami97@gmail.com

Abstract: In today's digital era, many educational institutions are transitioning to automated systems to support more efficient administrative processes. MTs Ma'arif 30 Sumber Rejeki Mataram Lampung, as one of these institutions, still faces several issues in managing teacher payroll, which is currently handled manually. This manual process often leads to miscalculations, delayed payments, and inaccuracies in payroll data. Therefore, an information system is needed to automate and simplify payroll data management in order to improve efficiency and accuracy. This study aims to design a Web-Based Teacher Payroll Information System using the CodeIgniter framework. The system is expected to manage payroll data more accurately, including salary calculations, allowances, deductions, and the generation of more efficient and transparent reports. The method used in this study is the Waterfall model, which consists of five main stages: requirements analysis, system design, implementation, testing, and maintenance. The results of the study show that the developed system successfully automates the payroll process, reduces calculation errors, and simplifies the generation of payroll reports that can be easily accessed by relevant parties. The conclusion of this research is that the web-based payroll information system designed can improve efficiency, transparency, and accuracy in the management of teacher salaries at MTs Ma'arif 30 Sumber Rejeki Mataram Lampung.

Keywords:Payroll Information System, Web, CodeIgniter, Waterfall, MTs Ma'arif 30.

1. Introduction

Millions and as a significant contributor to the national Gross Domestic Product The rapid development of information technology has had a significant impact on various sectors of life, including the field of education. The use of technology in educational institutions is no longer limited to teaching and learning activities but also extends to administrative and managerial aspects, such as teacher payroll systems. An integrated and digital-based information system is

https://doi.org/10.35877/jetech4173

ISSN : 2776-7914 (Print) / 2807-3045 (Online)

essential to support operational efficiency and effectiveness in educational institutions (Laudon & Laudon, 2020).

MTs Ma'arif 30 Sumber Rejeki Mataram Lampung, as a private educational institution, still faces challenges in managing its teacher payroll system, which is currently handled manually. This manual system is prone to several problems, such as salary miscalculations, payment delays, disorganized record-keeping, and difficulties in generating accurate and timely reports. These issues not only hinder administrative processes but may also reduce teachers' satisfaction and trust in the institution's system (Indrajit, 2017).

According to O'Brien and Marakas (2015), a well-implemented management information system can help organizations process data into useful information, accelerate business processes, and support decision-making. Therefore, the need for a reliable payroll information system becomes crucial, especially in supporting transparency and accountability within educational institutions.

Implementing a web-based payroll information system offers numerous advantages, such as flexible access, minimized data loss risk, and real-time record-keeping. One of the widely used frameworks for web application development is CodeIgniter 4. This framework is known for being lightweight, utilizing the Model-View-Controller (MVC) structure, and having good documentation, making it suitable for small to medium-scale system development (Widodo & Santosa, 2020).

Choosing the right software development methodology is also crucial to producing a system that meets user needs. In this context, the Waterfall method is used due to its systematic and structured workflow, which includes requirements analysis, system design, implementation, testing, and maintenance (Pressman & Maxim, 2020). This method is appropriate for developing information systems with clearly defined functional requirements from the outset.

Previous studies have also shown that the implementation of web-based payroll systems can improve work efficiency, reduce administrative burdens, and minimize human errors (Hasibuan & Nasution, 2019). Moreover, a web-based system can assist management in monitoring and evaluating routine expenditures, particularly salaries, allowances, and deductions.

Therefore, this study aims to design and develop a web-based teacher payroll information system using the CodeIgniter 4 framework at MTs Ma'arif 30 Sumber Rejeki Mataram Lampung. It is expected that this system will provide a solution to the problems encountered and serve as a model for other educational institutions facing similar challenges.

2. Literature Review

2.1. Information Systems

An information system is a combination of work procedures, information, and technology used to assist management and decision-making processes within an organization. O'Brien and Marakas (2015) state that an information system is a set of interrelated components for collecting, processing, storing, and distributing information to support decision-making, coordination, analysis, and visualization within an organization. Information systems are not limited to technology but also include people and business processes. Therefore, the design and implementation of information systems must be tailored to user needs to ensure optimal functionality (Laudon & Laudon, 2020).

2.2. Payroll Information Systems

A payroll information system is used to manage all activities related to calculating, recording, and processing employee salaries. This includes entering employee data, calculating basic salary,

https://doi.org/10.35877/jetech4173

ISSN : 2776-7914 (Print) / 2807-3045 (Online)

allowances, deductions, and generating pay slips and monthly expenditure reports. According to Hasibuan and Nasution (2019), a computerized payroll information system increases efficiency and accuracy in managing an organization's financial data while minimizing errors that commonly occur in manual systems. Furthermore, payroll systems support transparency in financial administration, which is essential for public accountability in educational institutions.

2.3. Information System Development Using the Waterfall Method

The Waterfall model is a classic approach in software development that progresses linearly from one phase to the next: requirements analysis, system design, implementation, testing, and maintenance (Pressman & Maxim, 2020). Each stage must be completed before moving on to the next. This method is suitable for projects with clearly defined requirements and limited scope changes, such as school payroll systems. The advantages of the Waterfall model include structured processes, comprehensive documentation, and easier project management (Sommerville, 2016).

2.4. Web Technology and the CodeIgniter 4 Framework

Web-based applications offer advantages in terms of accessibility and flexibility, as they can be accessed through browsers from various devices without the need for installation. One of the popular PHP frameworks for web development is CodeIgniter 4. This framework uses the Model-View-Controller (MVC) architecture, separating application logic, presentation, and data management, thus facilitating system maintenance and future development (Widodo & Santosa, 2020). According to Santosa and Priyanto (2021), CodeIgniter 4 is highly suitable for developing school information systems because of its lightweight performance, security features, and high efficiency. Its comprehensive documentation and wide community support further enable fast and effective development.

2.5. Previous Studies

A study by Hasibuan and Nasution (2019) on web-based payroll systems revealed that using the CodeIgniter framework significantly improved the efficiency of payroll processes and financial reporting in educational institutions. The results showed that web-based information systems reduce salary miscalculations and accelerate payment processing. Meanwhile, Rahmawati and Nugroho (2021) found that payroll systems developed using the Waterfall approach can be effectively implemented and accepted by users when supported by adequate training and documentation.

3. Method

3.1. System Design Method

This study adopts the Waterfall method as the approach to designing and developing the web-based teacher payroll information system. The Waterfall model is chosen because it provides a systematic and structured workflow, making it highly suitable for projects with clearly defined system requirements from the beginning. This model consists of five sequential stages: requirements analysis, system design, implementation, testing, and maintenance. The first stage, requirements analysis, was conducted through direct observation and interviews with administrative staff at MTs Ma'arif 30 Sumber Rejeki Mataram Lampung to understand the problems and both functional and non-functional needs of the payroll system to be developed. The findings from this stage served as the foundation for the system design phase, which included database structure development, user interface design, and system flow mapping using UML diagrams. Once the design was complete, the system was implemented using the CodeIgniter 4 framework, a PHP-based platform that applies the Model-View-Controller (MVC) pattern,

https://doi.org/10.35877/jetech4173

ISSN : 2776-7914 (Print) / 2807-3045 (Online)

facilitating modular code management and future development. System testing was carried out using the black-box testing method to ensure that each function performed as expected based on system inputs and outputs. The final stage, system maintenance, includes debugging and making adjustments if any changes or updates are required by users in the future.

3.2. Existing System

Currently, the payroll system at MTs Ma'arif 30 Sumber Rejeki Mataram Lampung is still managed manually using spreadsheet software like Microsoft Excel. Each month, the administrative staff calculates teacher salaries individually by manually entering attendance records, allowances, deductions, and other components. Pay slips are printed and distributed physically, and monthly and annual reports are generated separately. The system lacks a centralized digital database to store payroll records in a sustainable manner, making data search and retrieval inefficient and time-consuming.

3.3. Problems in the Existing System

Several major issues are found in the current manual payroll system. First, there is a high risk of salary miscalculations due to human error during manual data input. Second, the data processing takes a long time, which often leads to delays in payments and reporting. The system also lacks the ability to store and quickly retrieve historical data, making it difficult to conduct audits or financial reconciliations. Furthermore, there is a lack of transparency, as teachers cannot independently track their payroll information and must rely on administrative staff for updates.

3.4. Proposed System

To address these issues, this research proposes the development of a web-based teacher payroll information system using the CodeIgniter 4 framework. The system is designed to automate the entire payroll process, from employee data entry and salary calculation to the generation of pay slips and payroll reports in digital format. With this system, all payroll tasks can be carried out faster, more accurately, and in an integrated manner on a single platform. The system also features role-based access, allowing administrators to manage payroll data and enabling teachers to view their payroll history independently. This proposed system is expected to enhance administrative efficiency, reduce potential errors, and improve transparency and accountability in the school's financial management. Additionally, it could serve as a model that may be adopted by other educational institutions facing similar challenges.

4. Results and Discussion

4.1. Result

4.1.1. Proposed System Flowchart

Let me know if you'd like me to help create the flowchart diagram or write the narrative explanation for it.

https://doi.org/10.35877/jetech4173

ISSN : 2776-7914 (Print) / 2807-3045 (Online)

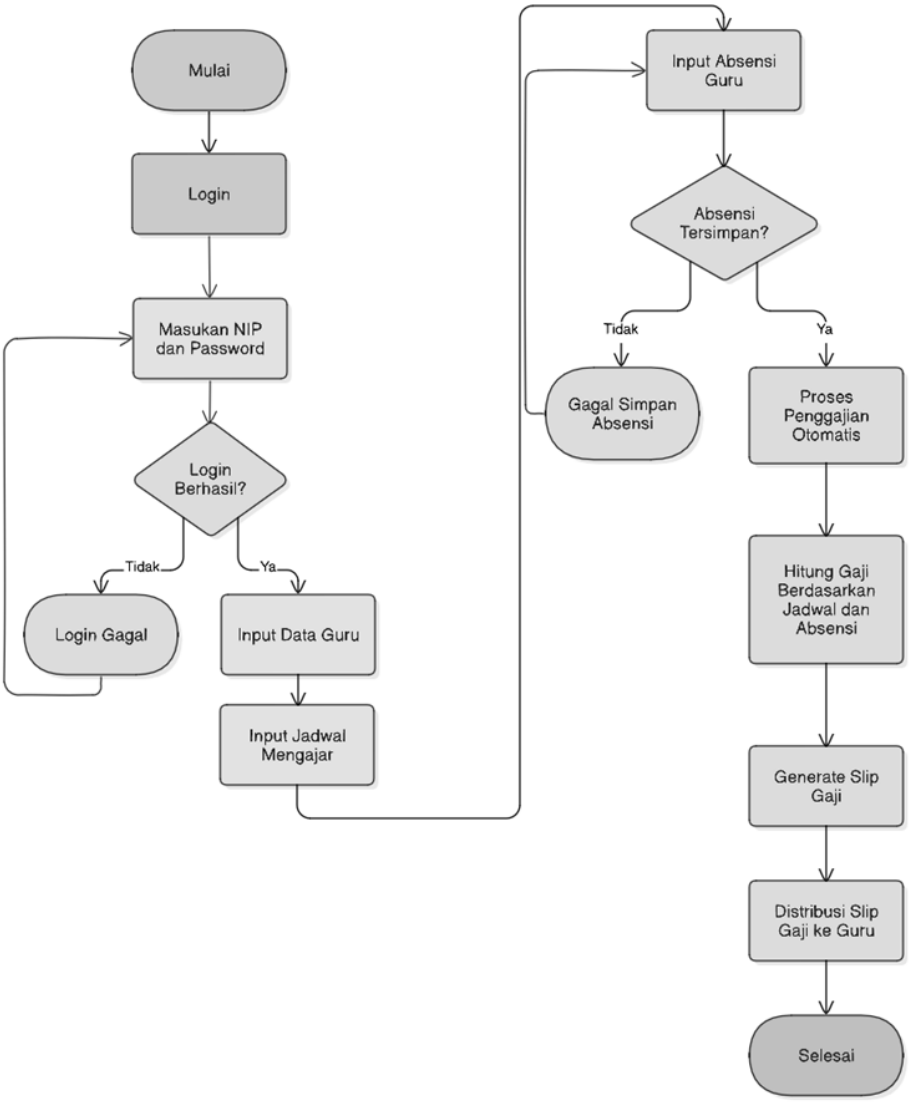


Figure 1. Flowchart

The proposed system flowchart illustrates the automation process of the teacher payroll system, starting from the user login stage. The system begins with the administrator logging in by entering their NIP and password. If the login is successful, the administrator can proceed to input teacher data and teaching schedules. After the schedules are entered, teacher attendance is recorded through the system. The system then checks whether the attendance data has been successfully saved; if not, the process is halted with an error message. If the attendance is saved correctly, the system automatically calculates the salary based on the teaching schedule and attendance records. The next step involves generating the teacher's payslip, which is then distributed to each respective teacher. The entire process is streamlined to ensure data accuracy, minimize human error, and improve the efficiency of salary management from data entry to salary distribution.

https://doi.org/10.35877/jetech4173

ISSN : 2776-7914 (Print) / 2807-3045 (Online)

4.1.2. Use Case Diagram

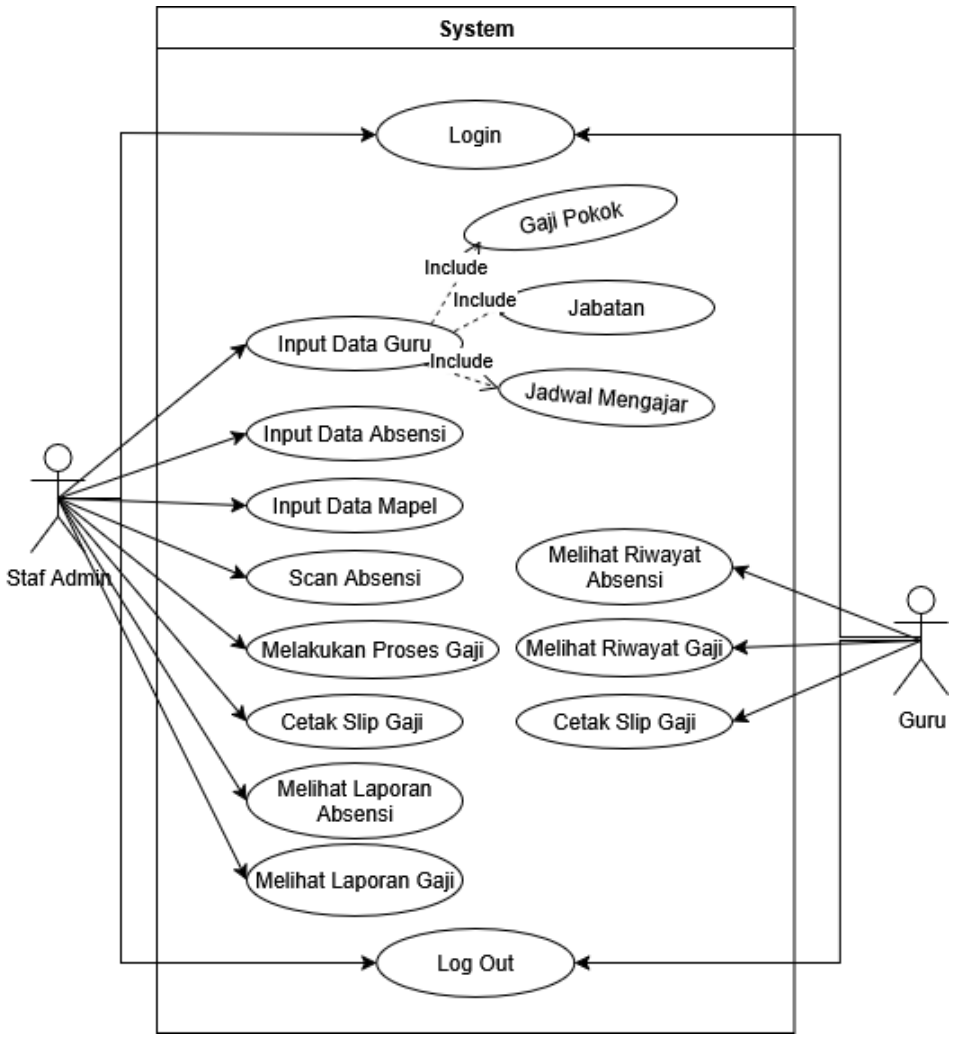


Figure 2. Use Case Diagram

The use case diagram illustrates the interaction between two primary actors in the system: the Staff Admin and the Teacher (Guru). The diagram begins with the login process, which grants access to various system functionalities based on user roles. The Staff Admin is responsible for managing the core operations of the payroll system, including inputting teacher data, subject data, and attendance data, as well as scanning attendance, processing payroll, generating and printing payslips, and viewing both attendance and payroll reports. Each input of teacher data includes associated details such as base salary, job position, and teaching schedule, which are essential for accurate payroll calculation. Meanwhile, teachers have access to view their attendance records, view payroll history, and print their payslips independently, promoting transparency and reducing administrative workload. Both actors are also able to log out after completing their tasks. This use case diagram clearly maps out the division of responsibilities and shows how each actor interacts with the system to perform specific tasks in a structured and secure manner.

https://doi.org/10.35877/jetech4173

ISSN : 2776-7914 (Print) / 2807-3045 (Online)

4.1.3. Proposed System

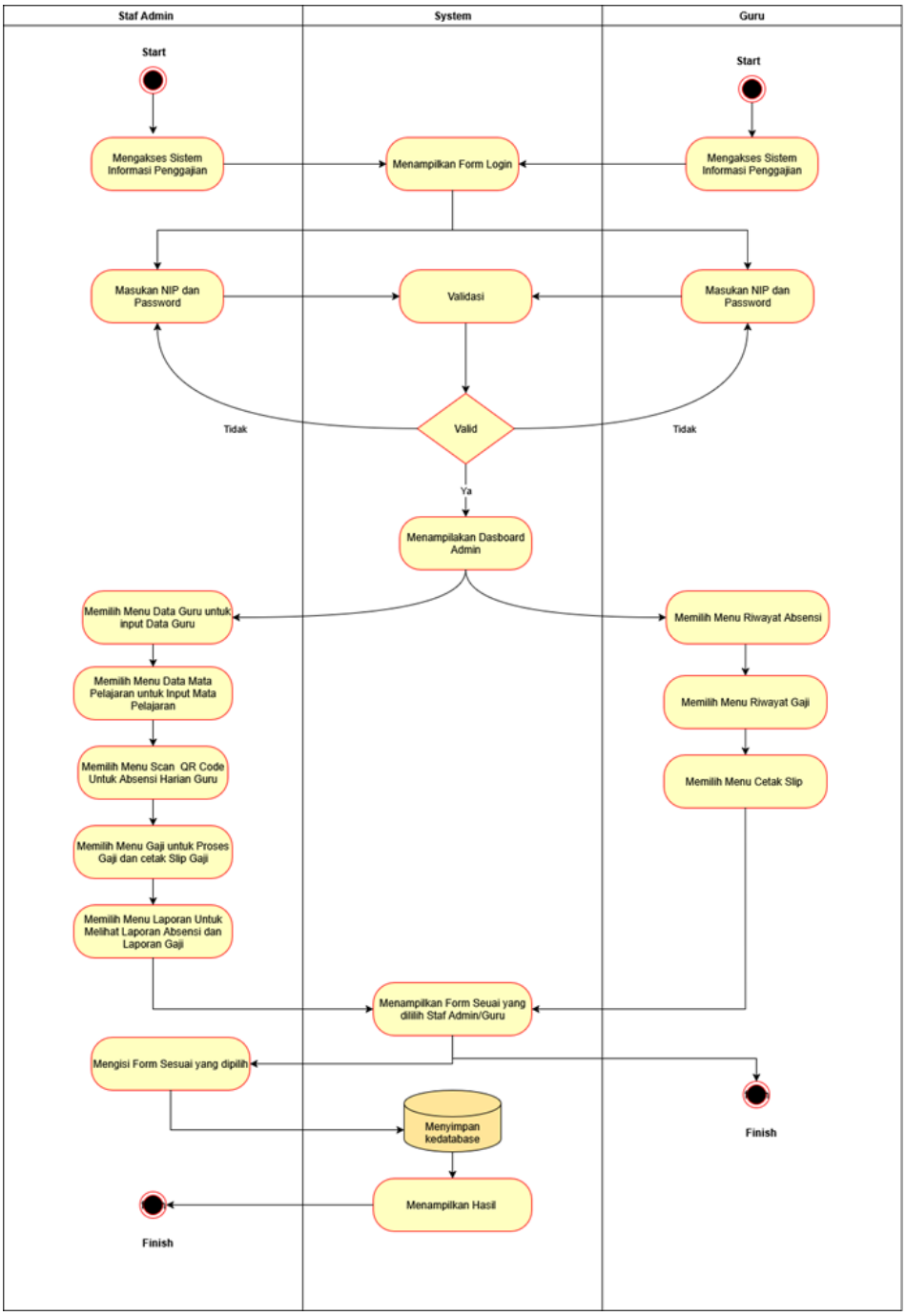


Figure 3. Proposed System

The proposed system is illustrated through a detailed activity diagram that outlines the interactions between the staff admin, the system, and the teacher (guru) in operating the web-based payroll application. The process begins when both the admin and teacher access the system and proceed to the login form, where they input their respective NIP and passwords. The system

https://doi.org/10.35877/jetech4173

OPEN ACCESS

ISSN : 2776-7914 (Print) / 2807-3045 (Online)

then performs validation; if valid, the dashboard corresponding to the user's role is displayed. For staff admin, the dashboard provides access to various functions such as inputting teacher data, entering subject data, scanning daily attendance via QR code, processing payroll, printing payslips, and viewing reports for attendance and salary. Each selected menu leads to a specific form that must be filled out, which is then saved into the database and followed by a display of the output results. On the teacher's side, after successful login, they can view their attendance history, payroll details, and print their payslips directly through the system. This workflow demonstrates how the proposed system supports automation, accuracy, and role-based access control to streamline the payroll management process efficiently.

4.1.4. Diagram HIPO (Hierarchical Input Process Output)

The HIPO (Hierarchical Input Process Output) diagram provides an overall structural view of the web-based Teacher Payroll Information System. This diagram functions as a high-level design tool that breaks down the entire system into a hierarchy of modules, showing the relationships between inputs, processes, and outputs in a clear and organized manner.

At the top level of the diagram is the main system, which oversees the general flow and coordination of all payroll-related activities. This includes managing core data inputs such as teacher data, subject data, and attendance records. Each of these inputs is processed through modules that handle validation, storage, and logic execution. For example, teacher and subject data are used to define teaching schedules and determine applicable allowances, while attendance data is used to track teaching performance and punctuality.

The next level in the hierarchy is the payroll processing module, which takes the validated and stored input data to compute each teacher's salary. This includes calculating base salary, applying deductions (if any), and generating a detailed payslip. Once processed, the system produces various output reports such as salary slips, monthly attendance summaries, and payroll recapitulation reports that can be exported in PDF or Excel format.

By visualizing the system's components hierarchically, the HIPO diagram facilitates easier understanding, development, and maintenance of the application. It enables developers and stakeholders to focus on smaller, manageable units while maintaining a comprehensive view of how each component contributes to the overall functionality of the system.

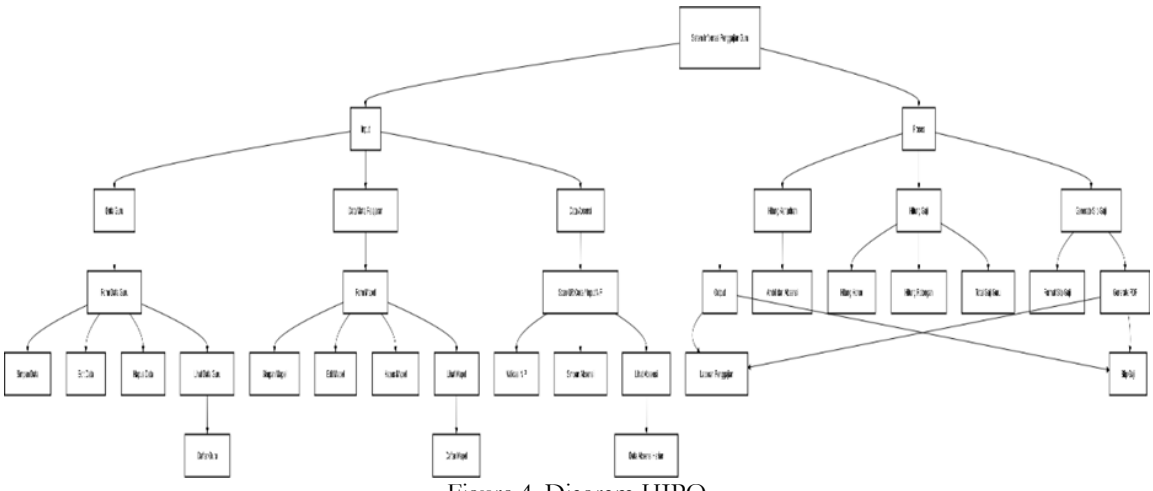


Figure 4. Diagram HIPO

https://doi.org/10.35877/jetech4173

ISSN : 2776-7914 (Print) / 2807-3045 (Online)

4.2. Implementation

4.2.1. Admin Dashboard Display

The admin dashboard interface in the Teacher Payroll Application of MTs Ma'arif 30 Sumber Rejeki presents a well-structured and informative layout that enables administrators to monitor key data in real-time. At the top of the dashboard, three main indicators display the total number of teachers (14), total absences for the current month (0), and the number of saved payslips (0), each highlighted in different colors for visual emphasis. The left-hand navigation menu includes essential features such as Dashboard, Teacher Data, Subject Data, Attendance, Scan Attendance, Payroll, Attendance Report, Payroll Report, Change Password, and Logout. Additionally, a personalized greeting "HELLO, ADMIN!" appears alongside the institution's logo and current date, adding a friendly yet professional touch to the system interface.

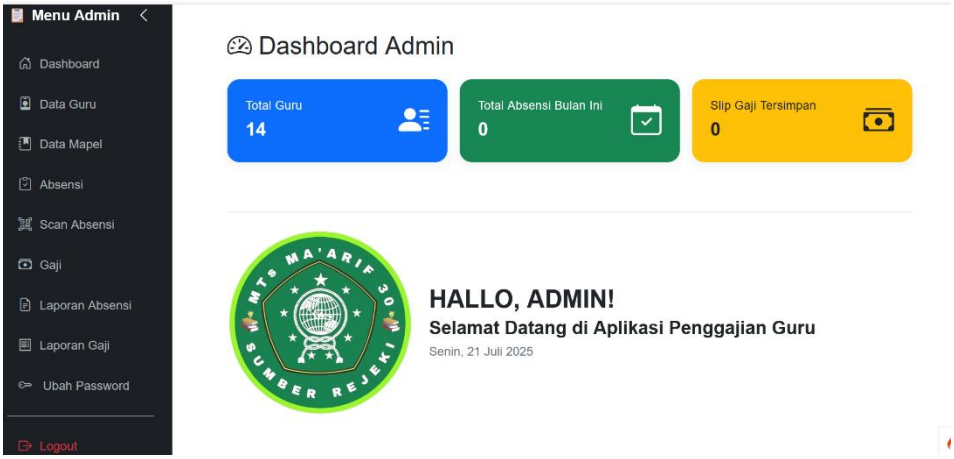


Figure 5 Admin Dashboard Display

4.2.2. Teacher Data Display

The Teacher Data display in the Teacher Payroll Application provides key information on each teacher's profile and salary status in a systematic table format. Each row contains the serial number, teacher ID (NIP), name, position, subjects taught, and basic salary. For example, the teacher with ID KPL001, named Rokhim, serves as the Principal and receives a basic salary of Rp 500,000, while Ngatmini, a Subject Teacher handling three subjects, currently has a recorded basic salary of Rp 0. Action buttons in the form of edit (pencil icon) and delete (trash bin icon) are available for each row, allowing the admin to update or remove teacher data efficiently. Additionally, a Add Teacher button at the top provides functionality to input new teacher data into the system.

https://doi.org/10.35877/jetech4173

ISSN : 2776-7914 (Print) / 2807-3045 (Online)

Figure 6 Teacher Data Display

4.2.3. QR Code Attendance Form Display

The QR Code Attendance Form in the teacher payroll application is designed to streamline attendance recording in a digital and efficient manner. The system offers two input options: scanning directly using the device's camera (by clicking Request Camera Permissions) or uploading a QR code image (Scan an Image File). Once the QR Code is successfully scanned, the system automatically fills in the NIP field according to the encoded data. The admin then simply clicks the blue Save Attendance button to record the attendance data. This approach makes the attendance process more practical, faster, and reduces the risk of manual input errors.

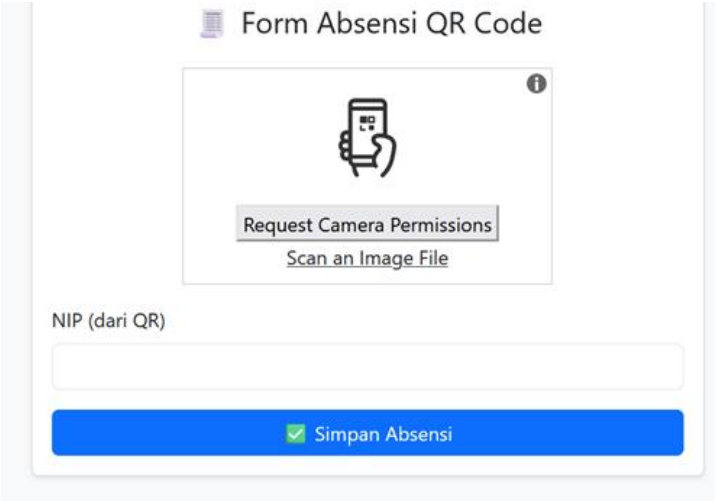


Figure 7 QR Code Attendance Form Display

4.3. Testing

After completing the system development stages, the next step is system testing to ensure that the application functions properly and meets user requirements. In this research, two types of testing methods were applied: Black Box Testing and White Box Testing. Black Box Testing focuses on testing the functional aspects of the system without considering the internal code structure. This method evaluates whether the system's inputs produce the expected outputs and whether each feature operates according to the predefined requirements. Black Box Testing was conducted on key functionalities such as login, data input (teacher, subjects, attendance), payroll

https://doi.org/10.35877/jetech4173

ISSN : 2776-7914 (Print) / 2807-3045 (Online)

processing, payslip generation, and report viewing. The results indicated that each feature behaved as expected, validating that the user interface and system responses align with the user workflow. Meanwhile, White Box Testing was performed to examine the internal logic, code structure, and flow of the program. This testing method verifies code execution paths, decision points, and possible loop iterations to ensure there are no logical errors or redundant code segments. White Box Testing was applied during the development phase to check individual modules, especially on payroll calculation functions and database interactions. The outcomes confirmed that all control structures, conditional branches, and loops executed correctly, contributing to system stability and efficiency. In conclusion, both testing approaches demonstrated that the proposed payroll information system performs reliably and effectively, with accurate data processing, minimal errors, and a user-friendly interface that meets the operational needs of MTs Ma'arif 30 Sumber Rejeki Mataram Lampung.

Table 1. BlackBox Testing

No.	Fungsi	Data Masukan	Hasil yang Diharapkan	Keterangan
1	Validasi Login Admin	Menampilkan form login untuk admin	Aplikasi akan masuk ke dalam halaman dashboard admin	Diterima
2	Validasi Login Guru	Menampilkan form login untuk guru	Aplikasi akan masuk ke dalam halaman dashboard guru	Diterima
3	Validasi Input Data Guru	Menampilkan form tambah data guru	Data guru berhasil tersimpan di dalam database	Diterima
4	Validasi Input Mata Pelajaran	Menampilkan form tambah mapel	Data mapel berhasil disimpan di dalam tabel mapel	Diterima
5	Validasi Input Absensi Manual	Menampilkan form input absensi berdasarkan NIP dan tanggal	Data absensi tersimpan dan status kehadiran tercatat	Diterima
6	Validasi Scan Absensi QR Code	Menampilkan form scan QR code	QR code terbaca, status absensi otomatis tersimpan sebagai Hadir	Diterima
7	Validasi Perhitungan Gaji Guru Mapel	Menampilkan tombol proses hitung gaji berdasarkan jadwal	Gaji dihitung otomatis berdasarkan jumlah mapel dan absensi	Diterima
8	Validasi Cetak Slip Gaji	Menampilkan tombol cetak slip gaji berdasarkan bulan & NIP	Slip gaji ditampilkan dan dapat diunduh sebagai file PDF	Diterima
9	Validasi Rekapitulasi Absensi Bulanan	Menampilkan rekap absensi berdasarkan bulan dan guru	Data absensi bulanan per tanggal ditampilkan dalam bentuk tabel	Diterima
10	Validasi Laporan Absensi	Menampilkan form filter laporan absensi	Laporan absensi dapat di-generate dan diunduh (PDF/Excel)	Diterima
11	Validasi Laporan Gaji	Menampilkan form filter laporan gaji	Laporan gaji guru per bulan dapat diunduh dalam bentuk tabel dan PDF	Diterima

5. Conclusion

Based on the results of the research, analysis, design, implementation, and testing conducted on the web-based Teacher Payroll Information System using the CodeIgniter 4 framework at MTs Ma'arif 30 Sumber Rejeki Mataram Lampung, several conclusions can be drawn. First, the development of the payroll system successfully addressed the main issues found in the existing

https://doi.org/10.35877/jetech4173

ISSN : 2776-7914 (Print) / 2807-3045 (Online)

manual system, particularly those related to inefficiency, human error in calculations, and the lack of transparency in salary distribution. By implementing this system, the administrative processes—especially payroll computation, attendance recording, payslip generation, and report creation—have become more automated, efficient, and accurate.

Second, the system's functionality was validated through Black Box and White Box Testing, and all major features, such as user login, data entry, QR code attendance scanning, salary calculation, and report generation, performed as expected. These results indicate that the system is functionally reliable and suitable for use in daily school operations.

Lastly, the proposed web-based system enhances transparency and user accessibility, particularly by enabling teachers to independently view their salary details and attendance history. This not only improves user satisfaction but also reduces the administrative burden. In conclusion, the payroll information system developed in this study provides a practical and scalable solution for managing payroll in educational institutions and can serve as a reference model for similar implementations in other schools.

References

Bilgihan, A. (2016). Gen Y customer loyalty in online shopping: An integrated model of trust, user experience and branding. Computers in Human Behavior, 61, 103–113. https://doi.org/10.1016/j.chb.2016.03.014

Buhalis, D., & Leung, R. (2018). Smart hospitality—Interconnectivity and interoperability towards an ecosystem. International Journal of Hospitality Management, 71, 41–50. https://doi.org/10.1016/j.ijhm.2017.11.011

Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2020). Smart tourism: Foundations and developments. Electronic Markets, 30(1), 7–18. https://doi.org/10.1007/s12525-020-00419-9

Gretzel, U., Koo, C., Sigala, M., & Xiang, Z. (2021). Perspectives on the Post-COVID Digital Transformation of the Tourism Sector. Journal of Tourism Futures, 7(3), 295–300. https://doi.org/10.1108/JTF-12-2020-0239

Hasibuan, M. I., & Nasution, I. F. (2019). Web-Based Payroll Information System Using CodeIgniter Framework. Journal of Informatics Engineering and Information Systems, 7(2), 89–96.

Laudon, K. C., & Laudon, J. P. (2020). Management Information Systems: Managing the Digital Firm (16th ed.). Pearson.

O'Brien, J. A., & Marakas, G. M. (2015). Management Information Systems (10th ed.). McGraw-Hill Education.

Pressman, R. S., & Maxim, B. R. (2020). Software Engineering: A Practitioner's Approach (9th ed.). McGraw-Hill Education.

Rahmawati, E., & Nugroho, A. S. (2021). Development of a Web-Based Payroll Information System in Educational Institutions. Journal of Information Technology and Computer Science, 9(1), 45–53.

Santosa, P. I., & Priyanto, A. (2021). Professional Web Programming with CodeIgniter 4. Yogyakarta: Andi Publisher.

Sommerville, I. (2016). Software Engineering (10th ed.). Pearson.

Widodo, S. E., & Santosa, P. I. (2020). Web Programming with CodeIgniter 4 for Beginners. Yogyakarta: Deepublish.