JITK (JURNAL ILMU PENGETAHUAN DAN TEKNOLOGI KOMPUTER)

VOL. 11. NO. 3 FEBRUARI 2026
P-ISSN: 2685-8223 | E-ISSN: 2527-4864
DOI: 10.33480/jitk.v11i3.7044

WEB-BASED PAYROLL SYSTEM DEVELOPMENT USING THE PROTOTYPING METHOD AND STRUCTURED DATABASE DESIGN

Felix Tandrio[1]; Melissa Indah Fianty[1*]

Information System[1]
Universitas Multimedia Nusantara, Indonesia[1]
www.umn.ac.id[1]
felix.tandrio@student.umn.ac.id, melissa.indah@umn.ac.id[*]

(*) Corresponding Author
(Responsible for the Quality of Paper Content)

Abstract—*Effective payroll management is essential for accurate salary calculations and efficient financial operations. Many companies, including beverage distribution firms, still rely on spreadsheet-based payroll systems using Microsoft Excel. While Excel provides computational flexibility, it requires extensive human intervention, making it a semi-manual process prone to errors, data inconsistency, and limited scalability. This study develops a web-based payroll information system using a structured workflow that combines the Prototyping method and the Database System Development Life Cycle (DSDLC). Methodology includes business process analysis with the 5W+1H approach, database design using UML, normalization, SQL implementation, and user interface development based on the KISS principle. The system was implemented with MySQL and PHP/Laravel. Evaluation through User Acceptance Testing (UAT) with payroll administrators and HR staff yielded a satisfaction score of 90.8% (Highly Eligible). The successful implementation demonstrates enhanced payroll efficiency, data integrity, and user accessibility. The system shows potential for scalability and future improvements, including cloud integration, advanced security, and financial system connectivity*.

Keywords: *Database Design, Payroll System, Prototyping Method, User Acceptance Testing, Web-Based Application.*

Intisari—*Pengelolaan penggajian yang efektif sangat penting untuk memastikan ketepatan perhitungan gaji dan efisiensi operasi keuangan. Banyak perusahaan, termasuk di bidang distribusi minuman, masih menggunakan sistem penggajian berbasis spreadsheet dengan Microsoft Excel. Meskipun Excel menyediakan fleksibilitas komputasi, sistem ini memerlukan intervensi manusia secara intensif, sehingga tergolong proses semi-manual yang rentan terhadap kesalahan, inkonsistensi data, dan keterbatasan skalabilitas. Penelitian ini mengembangkan sistem informasi penggajian berbasis web melalui alur kerja terstruktur yang menggabungkan metode Prototyping dan Database System Development Life Cycle (DSDLC). Metodologi mencakup analisis proses bisnis menggunakan pendekatan 5W+1H, perancangan basis data dengan UML, normalisasi, implementasi SQL, serta pengembangan antarmuka pengguna berdasarkan prinsip KISS. Sistem dibangun menggunakan MySQL dan PHP/Laravel. Evaluasi melalui User Acceptance Testing (UAT) dengan administrator penggajian dan staf HR menghasilkan skor kepuasan 90,8% (Sangat Layak). Implementasi yang berhasil menunjukkan peningkatan efisiensi penggajian, integritas data, dan kemudahan akses bagi pengguna. Sistem ini memiliki potensi untuk diskalakan dan dikembangkan lebih lanjut, termasuk integrasi berbasis cloud, penguatan keamanan, serta konektivitas dengan sistem keuangan*.

Kata Kunci: *Perancangan Basis Data, Sistem Penggajian, Metode Prototyping, Pengujian Penerimaan Pengguna, Aplikasi Berbasis Web.*

VOL. 11. NO. 3 FEBRUARY 2026
P-ISSN: 2685-8223 | E-ISSN: 2527-4864
DOI: 10.33480 /jitk.v11i3.7044

JITK (JURNAL ILMU PENGETAHUAN DAN TEKNOLOGI KOMPUTER)

INTRODUCTION

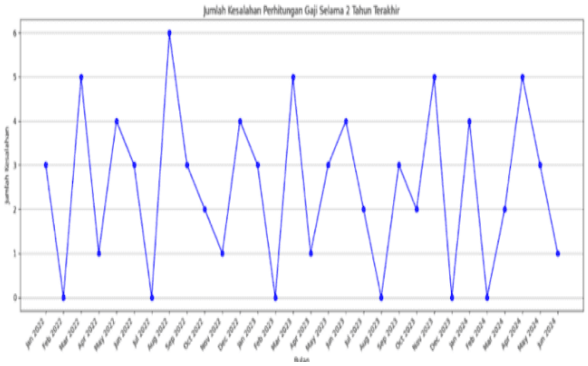
Information technology has developed rapidly, allowing companies to automate various business processes to improve operational efficiency and effectiveness [1]. These developments have transformed manual technology into automated technology [2]. In the field of business, both trade in goods and services [3]. Information technology will be essential for routine, periodic, and incidental transaction activities and will provide a lot of information quickly and precisely. One of the applications is in employee salary management which includes the process of payment, attendance, overtime, benefits, and bonuses.

However, there are still many companies that still have not implemented employee salary management. Salary is the income workers receive as compensation for the work performed and is a crucial factor in business activities [4]. Salaries are typically paid monthly and play a key role in employee motivation and retention [5]. However, higher salaries can also present challenges such as taxes, insurance, and other obligations.

This company is a beverage distributor company in Jambi City. As part of sustaining effective business performance, the organization disburses salaries to its staff. If the salary received by the employee is getting bigger, it means that his position is getting higher, his status is getting better, and the fulfillment of the needs he enjoys is getting more and more. Thus, his job satisfaction is also getting better. However, payroll activities and determining salary increases carried out in the Company still use Microsoft Excel-based manual methods for the payroll process.

This method is prone to corrupt files, and data management that is not centralized and takes a long time to determine salary increases, thus causing inaccurate calculations and employee dissatisfaction. In addition, problems with the employee payroll process at the Company occur because the data from HRD, admin, and company director are separate, so the salary calculation is done manually by the business director and takes 2-3 hours. This often causes inaccuracies, such as differences in salary calculations due to human error, which have an impact on losses, employee dissatisfaction, and decreased productivity. Figure 1 illustrates the trend of salary miscalculations within the company from January 2022 to June 2024.

Based on Figure 1, the graph shows the number of salary calculation errors at the Company over the past two years, from January 2022 to June 2024. The number of errors fluctuates every month, with a range from 0 to 6 errors. Some months recorded the highest number of errors, such as in August of 2022. These errors resulted in employee dissatisfaction and decreased productivity. By implementing a web-based database system, companies can store, manage, and access salary data more efficiently, as well as integrate various data such as attendance, overtime, and performance. Therefore, a database-based information system is needed to improve the efficiency and reliability of the payroll process [6], [7].



Source: (Research Results, 2025)

Figure 1. Salary miscalculation

A database refers to an organized set of interrelated data and accompanying metadata that is structured to support the informational requirements of an organization [8]. Data can be neatly organized and easily processed in the database. This is because the database is separate from the application programs that use the database and the database environment can be developed without impacting the programs that use the database. Based on this explanation, this research aims to create a web-based database system to receive, store, manage employee salary data and reports at the Company.

In the system, employees can take attendance automatically, then can calculate employee salaries, and can print pay slips and payroll reports [9]. The system built has been tested on the front end and back end with successful results at each test point. In the system, there are features for attendance, managing positions, managing employees, managing allowances, managing basic salary, managing payroll, and reports so that it can assist in managing employee payroll so that valid information, with the application of this system it is hoped that all obstacles regarding delays and inaccurate reports related to employee payroll problems can be overcome. The prototype method. In this study, there are employee attendance features, features

Accredited Rank 2 (Sinta 2) based on the Decree of the Dirjen Penguatan RisBang Kemenristekdikti No.225/E/KPT/2022, December 07, 2022. Published by LPPM Universitas Nusa Mandiri

VOL. 11. NO. 3 FEBRUARI 2026
P-ISSN: 2685-8223 | E-ISSN: 2527-4864
DOI: 10.33480/jitk.v11i3.7044

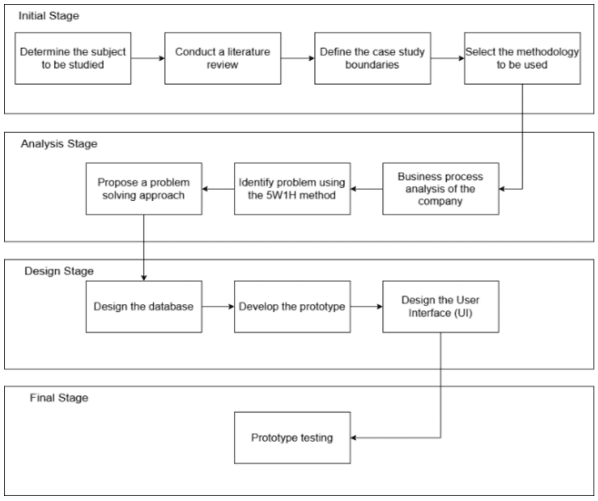
for managing employee data, features for reports, features for recapitulating the amount of salary payments, and features for sending salary slips. The system has been tested on the interface with the resulting average percentage of 100%. The features in the system are the attendance feature and the pay slip feature. The system that has been built has been tested front end and back end, resulting in an average percentage value of 100%. The adoption of this web-based payroll information system for honorary teachers facilitates the involvement of both the treasurer and the picket coordinator in payroll processes. It streamlines tasks such as salary computation, tracking individual loan deductions, and recording absences of the respective teachers. Additionally, the system enhances the speed and accuracy of payroll report generation.

Previous studies have contributed to the development of payroll systems using database frameworks similar to DSDLC, varying in database structure, normalization methods, and user interface design. Other research has examined web-based payroll system implementations and the use of the Prototyping method to ensure iterative feedback between developers and users. These studies provide insights into best practices and challenges in developing effective payroll information systems. Gaps remain in fully integrating database design, automated payroll processing, and user-friendly web interfaces into a single system. To address these gaps, this study develops a web-based payroll information system for the company using DSDLC and the Prototyping method, ensuring structured database management, accurate payroll computation, and alignment with user requirements. The DSDLC approach includes planning, requirement analysis, design, implementation, and evaluation [10], while the prototype method ensures continuous communication between developers and users. This organized web-based system enables the company to efficiently manage payroll and minimize salary calculation errors [11].

MATERIALS AND METHODS

Flow Work

The workflow applied in this research follows a structured process from the initial stage to the final implementation. The overall research framework is illustrated in the following figure, depicting each phase in detail.



Source: (Research Results, 2025)

Figure 2. Database Design and Development Workflow

Figure 2 is a picture of the framework used in this study. The stages in the Flow Work are as follows:

1. Determine the subject to be studied
   The subject to be studied is determined by obtaining permission from the business director to conduct research at the company. In addition to defining the subject, general observations and data collection are carried out to support the literature review. The subject of the research is information about payroll data, focusing on employee payroll systems over the past three years.
2. Conduct a literature review
   A literature review is conducted by collecting relevant previous studies, such as research on employee payroll systems, database development methods, and website creation [12]. Information from prior studies serves as a reference for understanding system requirements and forming the theoretical framework.
3. Establish the scope of the case study
   The scope of the case study is established to maintain a focused direction in the research, specifically targeting the design of a system using the Prototype method within a selected company. The focus includes designing the payroll database, developing a website for data management, and addressing identified payroll issues.
4. Select the methodology to be used
   This research employs the Database System Development Life Cycle (DSDLC) to design the payroll information system, providing a structured and systematic approach to each stage of database development, including

planning, requirement analysis, design, implementation, and evaluation. The database design is implemented using MySQL and modeled with StarUML to define entities, attributes, and relationships. For User Interface (UI) design, the KISS (Keep It Simple, Stupid) principle is applied to create a simple, efficient, and user-friendly interface. The UI is developed using HTML, CSS, JavaScript, and prototyping tools such as Figma, allowing iterative refinement based on user feedback. This combination ensures that the system is both technically robust and aligned with user requirements.[13], [14], [15].

5. Propose a problem-solving approach
   A business process analysis is conducted to understand the workflow and payroll system currently in use at the company [16], [17], [18]. This analysis involves interviews with five employees from the HR and finance divisions, selected based on their direct involvement in payroll preparation and approval. Direct observations were conducted over a one-week period during payroll processing to document existing workflows and identify system inefficiencies. The gathered information is used to identify weaknesses in the current process and determine specific requirements for the new system [19], [20].
6. Identify problem using 5W + 1H method
   Problem identification is conducted to assist in designing the system and database. Using the 5W + 1H method helps in problem resolution, defining the scope of the issues, creating a hierarchy of system usage, and pinpointing specific problems [21]. The 5W + 1H problem identification is carried out through interviews following an analysis of existing business processes [22]. The 5W + 1H problem identification is carried out through structured interviews with HR and finance staff to validate the issues identified during observation.
7. Proposing Problem Solutions
   Problem-solving proposals are based on the results of the 5W + 1H analysis. Solutions include designing a payroll calculation database system and a website for data usage and management [23].
8. Design the database
   A systematic approach is applied to create the database system using the Database System Development Life Cycle (DSDLC). DSDLC provides a structured framework for designing, building, and implementing databases, covering stages from planning to operational maintenance. Key phases include Database Planning, which defines mission and scope, System Definition, which outlines user views and limitations [24], [25]. Requirements Collection and Analysis using fact-finding techniques such as interviews and surveys, and Database Design, covering conceptual, logical, and physical models [26], [27]. The database is implemented using MySQL and modeled with StarUML to represent entities, attributes, and relationships [28], [29], [30]. Normalization is applied to minimize redundancy, while SQL is used for data retrieval, insertion, modification, and deletion. Constraints such as primary keys, foreign keys, and uniqueness rules ensure data integrity, and indexes improve query efficiency [31], [32]. Security measures include controlling user permissions, encrypting sensitive information, and protecting data against unauthorized access [33]. Challenges encountered include migrating data from Excel, maintaining data consistency, and ensuring performance and security.
9. Build the prototype
   The prototype was constructed to validate that the system requirements were properly addressed and to support the design of a user interface aligned with user expectations. Figma was used for prototype development, allowing iterative feedback from employees. Challenges included ensuring the prototype accurately represented payroll functionalities and meeting user expectations [34].
10. Design the User Interface (UI)
    The user interface was designed to ensure ease of use for employees at the company. The interface follows the KISS principle, focusing on simple layout, intuitive navigation, and appealing visuals. HTML, CSS, and JavaScript were used to implement the interface. A prototype was created and tested to gather user feedback, refining the design to align with usability requirements and payroll functionality. Challenges included aligning the design with user expectations and ensuring all payroll processes were accurately represented [35].
11. Prototype Testing
    Prototype testing was conducted after the system was built to evaluate its feasibility and effectiveness [36]. The process followed the DSDLC and Prototyping stages: planning, analysis, design, prototyping, user evaluation, and refinement [37], [38]. User feedback was gathered from HR and finance representatives through brief observation and structured questionnaires during prototype demonstrations. Feedback mainly concerned

Accredited Rank 2 (Sinta 2) based on the Decree of the Dirjen Penguatan RisBang Kemenristekdikti No.225/E/KPT/2022, December 07, 2022. Published by LPPM Universitas Nusa Mandiri

VOL. 11. NO. 3 FEBRUARI 2026
P-ISSN: 2685-8223 | E-ISSN: 2527-4864
DOI: 10.33480/jitk.v11i3.7044

interface clarity and calculation accuracy. Based on these inputs, several adjustments were made, such as simplifying input forms and improving automated payroll computation. User Acceptance Testing (UAT) was then conducted using checklists to verify functionality and usability . Iterative feedback sessions helped refine the final system design and ensure it met user expectations.

RESULTS AND DISCUSSION

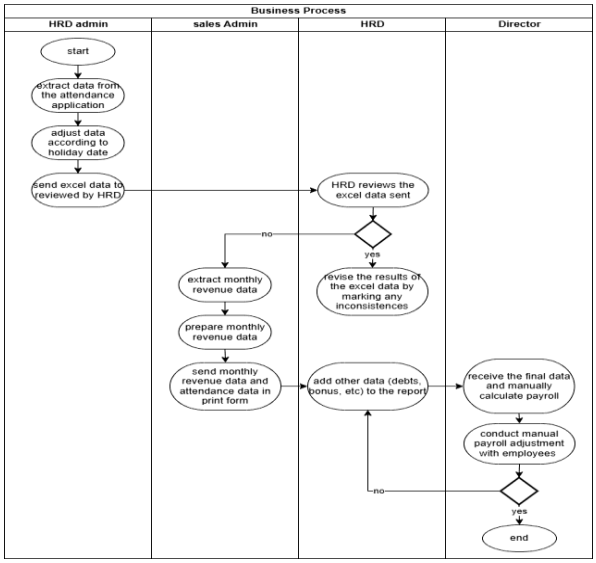
This study focuses on designing a payroll information system that addresses challenges in manual payroll processing. The system includes a structured database, a user-friendly website interface, and an application that automates payroll tasks such as commission calculation, tax adjustments, and attendance tracking. The research adopts the Database System Development Life Cycle (DBSDLC) for systematic database construction and the Keep It Simple, Stupid (KISS) principle to ensure an intuitive interface design. These methods support the development of a scalable and efficient payroll system tailored to the organization's needs.

A literature review of ten related studies highlights differences in focus, features, and development methods. While many used prototyping and Laravel frameworks, this study offers added value through performance-based increment suggestions and advanced reimbursement management. The system is designed for specific user roles within the organization HR staff, commission teams, finance departments, and company directors ensuring relevance and usability across operational functions.

Business Process Analysis of the Company

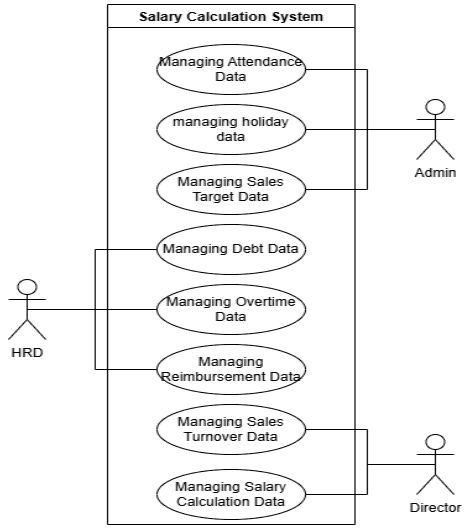
The employee salary calculation at the company follows a monthly cycle involving several stages. The process flow, as illustrated in Figure 5, outlines each step involved in the end-of-month payroll procedure.

Figure 3 illustrates the payroll process flow that begins with the attendance admin processing attendance data from the application, tidying it up according to SOP, and sending it to HRD for checking. Meanwhile, the Finance staff manages monthly sales data based on SOP, which is then printed on paper. This attendance and sales data is collected by HRD, along with related information such as debts and reimbursements, for salary calculation. The final stage involves the director calculating the salaries of employees at the end of the month. If no agreement is reached, the calculation will be repeated until a mutual agreement is found.



Source: (Research Results, 2025)
Figure 3. Salary calculation process

Figure 4, based on interviews with HRD, illustrates the interaction between users and data. Employees with admin roles in the HRD and sales departments can manage attendance data, holiday data, and sales targets with access to modify and view data. HRD employees can manage debt, overtime, and reimbursement data, with access to read, modify, delete, and create data. The company director can view all data managed by the HRD admin, sales admin, and HRD, which is used to manage sales turnover and salary calculations. The director can read, delete, modify, and create new data.



Source: (Research Results, 2025)
Figure 4. User interaction and data

The class diagram was also designed to represent the structure of the system, showing key classes like Employee, Admin, Attendance, Salary, Overtime, and Reimbursement, and the relationships between them. For example, the Admin class manages employee records, while the Employee class handles personal data, attendance, and salary. Other classes manage overtime requests and reimbursements.

Identify problem using the 5W+1H method

Problem identification was conducted using the 5W+1H method through interviews. The main issue is the discrepancy in salary calculations between employees and the company, causing delays and inefficiencies. Data management is fragmented across Finance, Attendance Admin, and HR, with storage on separate computers and some records still kept manually. The company needs an updated system to ensure accurate, fast, and centralized payroll processing. The new system will be used by the director and employees, with data updated monthly.

Propose a problem-solving approach

The proposed solutions are derived from a comprehensive analysis using the 5W+1H framework, ensuring that every aspect of the problem is thoroughly examined. This approach has highlighted the critical need for an integrated system that simplifies and streamlines payroll management processes at the company. To address this, the solution focuses on the design of a robust payroll database system and a user-friendly web application. These tools are expected to eliminate inefficiencies caused by manual data processing, improve accuracy in payroll calculations, and enhance the overall management of employee data.

By implementing a tailored payroll database and an intuitive website interface, this solution ensures that payroll processes become more automated, reliable, and scalable. The proposed system will not only meet the organization's current needs but also provide a foundation for future enhancements as the company grows. The integration of advanced features like seamless data management, automated tax adjustments, and detailed reporting ensures that the new system effectively resolves existing challenges while optimizing operational efficiency.

Design the database

In the early stage of system development, a use case diagram was designed to illustrate interactions between the system and its users. The system involves three main user roles: HRD, admin (comprising sales and HRD admin), and the director. Each role is responsible for different aspects of payroll management, such as attendance, sales targets, national holidays, overtime, reimbursements, debts, turnover, and salary calculations.

Database design began by formulating a mission statement, followed by identifying specific objectives to guide the database structure. These objectives include managing various payroll-related data such as debts, costs, overtime, reimbursements, turnover, salary, and salary increases. Each objective encompasses core operations like searching, adding, updating, and deleting records. The salary module also supports generating reports and viewing employee salary details. These functional goals formed the foundation for developing a structured and responsive payroll database system. These objectives are functionally detailed in Table 1, which outlines the core features and supported operations within the system.

Table 1. Mission Objectives

Name	Information
Debt	Searching for debt data
	Enables users to retrieve, add, modify, and remove debt-related information.
Cost	Searching for cost data
	Supports the management of expense records, including search, entry, and edits
Overtime	Searching for overtime data
	Facilitates handling of overtime data through viewing, updating, and deletion.
Reimbursement	Searching for reimbursement data
	Allows operations such as searching, adding, and editing reimbursement entries.
Turnover	Searching for turnover data
	Provides tools for managing turnover information, including all CRUD functions.
Wages	Searching for employee salary data
	Create a salary calculation report.
Salary increases	View salary increase data using the AHP-MAUT method.
	Maintain salary increase criteria data such as insert, update, and delete
	Viewing the AHP comparison scale
	View sub-criteria data during employee assessment.
	Maintain employee assessment data such as updates and deletes.

Source: (Research Results, 2025)

Following the problem identification, the user view analysis was conducted to define system requirements based on each role in the company. The roles involved include the Director, HRD, Attendance Admin, Sales Admin, and Employees.

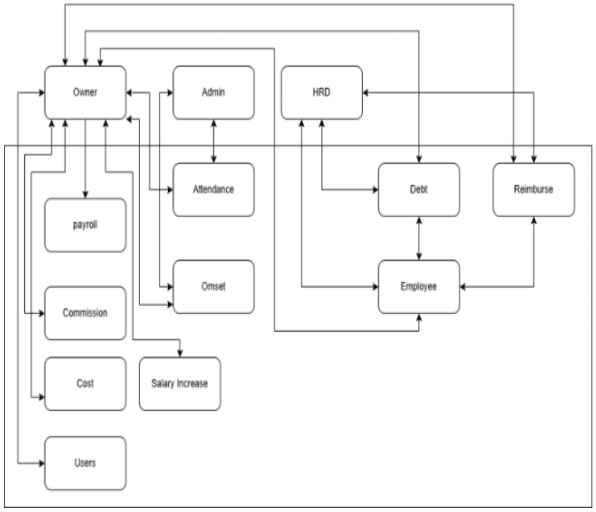
Accredited Rank 2 (Sinta 2) based on the Decree of the Dirjen Penguatan RisBang Kemenristekdikti No.225/E/KPT/2022, December 07, 2022. Published by LPPM Universitas Nusa Mandiri

VOL. 11. NO. 3 FEBRUARI 2026
P-ISSN: 2685-8223 | E-ISSN: 2527-4864
DOI: 10.33480/jitk.v11i3.7044

The Director has full access rights, both for maintaining and querying all payroll-related data, including employee records, salaries, commissions, and reports. HRD has access to maintain and view employee data, debts, reimbursements, overtime, and cost-related information, and can also view attendance, turnover, and national holiday data. Attendance Admin is responsible for maintaining and querying attendance and holiday data, while Sales Admin has access to turnover and cost data. Employees are granted limited access, primarily to input debt data and view reimbursements.

In addition, the system integrates an AHP–MAUT–based feature within the HRD role to support data-driven salary increase decisions. This feature allows HRD to evaluate employee performance criteria (such as attendance, productivity, and tenure) through a weighted multi-criteria model, ensuring fair and transparent salary adjustment recommendations.

These access levels serve as the foundation for designing the database structure and system boundaries, as illustrated in the system's data flow diagram.



Source: (Research Results, 2025)

Figure. 5. System Boundaries

As illustrated in Figure 5, attendance records are sourced from a dedicated application and subsequently entered into the system by the administrator responsible for managing attendance. The attendance admin will also input red dates for calculating holidays. After the data is entered, it will be checked by HRD for the data that has been entered. Furthermore, employees will enter reimbursement and/or debt data to apply for reimbursement or debt. HRD will approve both data by the applicable SOP. HRD is also responsible for entering existing overtime data and employee performance criteria for a month,

At this stage, sales turnover and item data were entered into the system by the sales admin. This data is then used in the monthly salary calculation process. During the database design process, candidate keys, primary keys, and alternate keys were identified for each entity. Entities such as Users, Employees, National Holiday, Goods, Commission, Debts, Expenses, Overtime, Reimbursement, Revenue, and Salaries use the Id attribute as the primary key. More complex entities, such as Criteria, Subcriteria, and Assessment, include additional candidate keys like Criteria_id and Subcriteria_id. This key assignment ensures that each record is uniquely identifiable, supporting data integrity and efficient relational mapping within the system.

The implemented database structure consists of sixteen tables, each applying candidate, primary, and alternate key definitions to ensure data integrity. In the Users table, several attributes were identified as candidate keys, with id selected as the primary key and others, such as name, email, username, and employee_id, as alternate keys. In the Employees table, both id and employee_name were candidate keys, but only id was used as the primary key. Similarly, in the National_Holidays table, id was chosen as the primary key, while holiday was retained as an alternate key. For other tables such as Attendance, Commissions, Debts, Expenses, Overtime, Reimbursements, Revenue, and Salaries, only the id attribute met the criteria for uniquely identifying records and was thus used as the sole primary key without alternate keys. This reflects a consistent approach in key assignment to maintain uniqueness and reliability across all entities in the database.

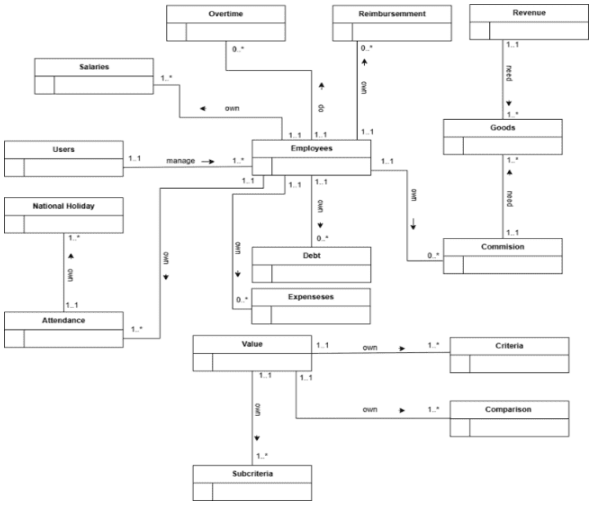
In the goods table, both id and item_name are capable of uniquely identifying entries. The primary key is assigned to the id attribute, while item_name serves as the alternate key. The criteria table follows a similar structure, with id functioning as the primary key and criteria_name as the alternate key. In the comparison_values table, comparison_id and comparison_name qualify as candidate keys, with comparison_id selected as the primary key and comparison_name used as an alternate key.

For the subcriteria table, the id and criteria_id attributes are identified as candidate keys. The primary key is assigned to the id, while criteria_id serves as the alternate key. Lastly, the assessment table incorporates id, criteria_id, subcriteria_id, and value as candidate keys. Here, id is used as the primary key, and both criteria_id and subcriteria_id are treated as alternate keys to

VOL. 11. NO. 3 FEBRUARY 2026
P-ISSN: 2685-8223 | E-ISSN: 2527-4864
DOI: 10.33480 /jitk.v11i3.7044

JITK (JURNAL ILMU PENGETAHUAN DAN TEKNOLOGI KOMPUTER)

support the relational structure of the database and maintain data consistency across related entities.



Source: (Research Results, 2025)

Figure 6. ERD with primary key

An Entity-Relationship Diagram (ERD) in Figure 6 was constructed using sixteen tables and their primary keys to depict the relationships among payroll system entities. The Users entity is linked to Employees, who in turn are connected to several other entities such as Attendance, Commission, Debts, Expenses, Overtime, Reimbursement, and Salaries, reflecting the various payroll-related activities associated with employees. National Holidays affect Attendance, while Goods are related to both Sales and Commission, as product sales influence revenue and commission calculations. The Assessment entity is connected to Criteria, Subcriteria, and Comparison Values, supporting employee evaluations through the AHP method. This ERD structure ensures that data relationships support integrated, efficient, and accurate payroll processing across user roles in the organization.At this stage, the focus is on designing both the database and the user interface.

Source: (Research Results, 2025)

Figure 7. Entity relationship diagram (ERD)

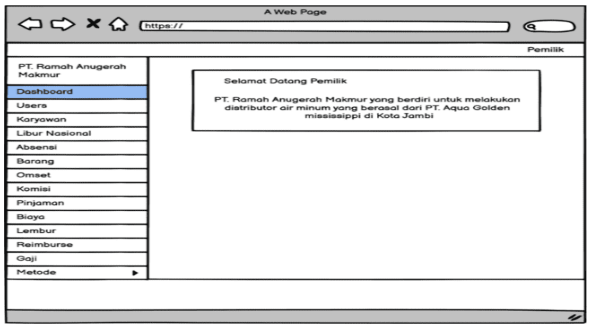
Figure 7 presents the detailed Entity Relationship Diagram (ERD) that visualizes the structure of the payroll information system's database, including the relationships between sixteen tables such as users, employees, salaries, attendance, transactions, and evaluation components. Primary and foreign key connections are depicted to indicate data flow and ensure referential integrity. Based on this design, an estimation of monthly storage requirements was also calculated, showing that each table contributes differently depending on record size and transaction volume. The total estimated storage per month is approximately 83,777 bytes, indicating that the system is efficient for regular operations. The ERD thus serves as a blueprint for implementing a relational database that supports accurate and integrated payroll management within the organization.

Accredited Rank 2 (Sinta 2) based on the Decree of the Dirjen Penguatan RisBang Kemenristekdikti No.225/E/KPT/2022, December 07, 2022. Published by LPPM Universitas Nusa Mandiri

VOL. 11. NO. 3 FEBRUARI 2026
P-ISSN: 2685-8223 | E-ISSN: 2527-4864
DOI: 10.33480/jitk.v11i3.7044

Develop the prototype

A user interface design was then carried out using the Balsamiq application, where the results of the user interface design, are 12 pages to manage employee data regarding salaries and so on, and 4 other pages are employee assessment pages using the AHP and MAUT methods. The design form, after being applied using PHP program code, can be seen in Figure 8.



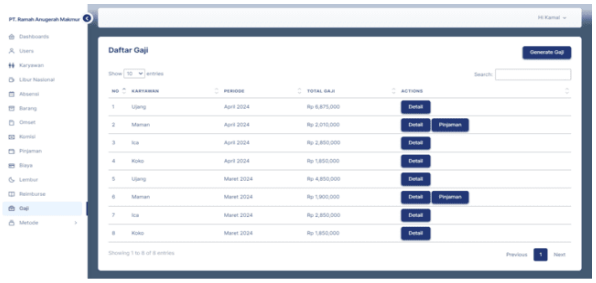
Source: (Research Results, 2025)

Figure 8. user interface design

The dashboard interface in Figure 8 includes a greeting message that displays “Welcome,” followed by the name of the user who is currently logged in. The interface illustrates a user with the role of owner, resulting in a role-specific welcome message. This page serves to confirm successful login and system access. The left sidebar contains a structured navigation menu with various options, including Dashboard, Users, Employees, and other administrative sections, enabling efficient system management. The layout is designed to enhance user experience by providing an intuitive and organized interface, ensuring seamless interaction and accessibility.

Design the user interface

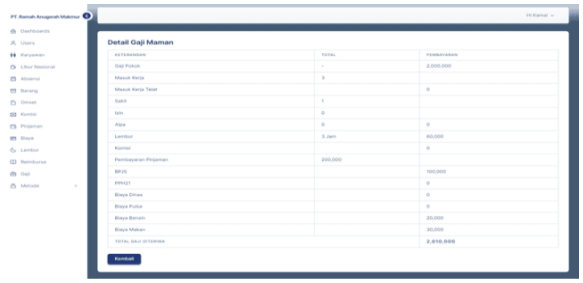
After completing the user interface design using Balsamiq, the next step is to design a web-based salary calculation application. The application design will be done using the Laravel framework, with the PHP programming language, and then MySQL will be used for the database. The dashboard displays a structured interface that greets the logged-in user, in this case 'Kamal', providing personalized access based on user role. This role-specific access allows the user to manage and navigate various system functionalities designated for directors. The system provides access to 13 main menu options, including Users, Employees, National Holidays, Attendance Records, Goods, Turnover, Commissions, Loans, Expenses, Overtime, Reimbursements, Salaries, and Methods. Additionally, the "Methods" menu is further divided into four submenus: Criteria, Evaluation, AHP Results, and MAUT Results, enabling more detailed management and decision-making processes. The dashboard layout ensures an organized and efficient navigation experience, facilitating streamlined operations within the system.



Source: (Research Results, 2025)

Figure 10. Salaries application design

Based on the display shown in figure 10, the "Salary List" page of the system presents a structured and user-friendly interface for managing salary records. The table provides essential details, including employee names, salary periods, total salary amounts, and available actions. Users can access detailed salary information or manage loans through action buttons in the "Actions" column. Additionally, the page features a "Generate Salary" button to process new salary records, enhancing efficiency in payroll management. Pagination at the bottom allows users to navigate through multiple entries seamlessly. The interface is designed to ensure clarity, accessibility, and functionality, supporting administrative tasks related to employee compensation effectively.

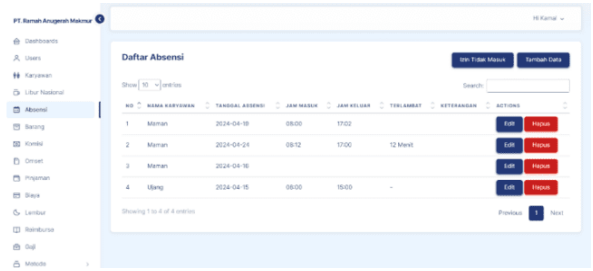


Source: (Research Results, 2025)

Figure 11. Detail salary application design

Based on the display shown in figure. 11, the "Salary Details" page presents a comprehensive breakdown of an employee's salary components within the system. The page provides detailed information for an employee named Maman, including the basic salary, deductions, and additional earnings. Key financial details such as workdays, late arrivals, overtime hours, loan repayments, and various deductions, including

social security contributions and other costs, are systematically organized in a structured table. The total net salary is prominently displayed at the bottom for clarity. Additionally, a "Back" button located at the bottom left allows users to return to the previous screen seamlessly. The interface is designed to offer clear, detailed, and easily accessible salary information, supporting efficient and transparent payroll management.



Source: (Research Results, 2025)

Figure 12. attendance application design

As shown in figure 12, the screenshot illustrates the interface of a digital attendance record system. The interface is organized in a table format, displaying various data points such as employee name, date, time in, time out, and any relevant remarks. Navigation buttons are positioned at the bottom of the table, enabling users to browse through different pages of data. Furthermore, the system provides options to search for specific records, add new entries, as well as edit or delete existing ones. The overall design of the interface emphasizes user-friendliness and intuitiveness, making it an efficient tool for managing employee attendance.

Prototype testing

The system underwent functional testing through both Black-box Testing and User Acceptance Testing (UAT). Black-box Testing was used to evaluate whether each system feature performed correctly based on four user roles: Director, HRD, Admin, and Employee. Core features such as login, attendance recording, turnover input, payroll processing, and data management were tested. All modules operated according to their specifications, with no critical errors reported.

For the UAT, ten representative users from the four roles completed a structured questionnaire assessing the system's performance across three key dimensions: usability, responsiveness, and interface clarity. Each question was rated using a 5-point Likert scale, ranging from "Strongly Disagree" (1) to "Strongly Agree" (5). The overall satisfaction score was 454 out of 500 (90.8%), classifying the system as "Highly Eligible."

A breakdown by user role showed consistent high scores: Director 92%, HRD 91%, Admin 89%, and Employee 90%. Descriptive statistics for each dimension were calculated as follows: usability 4.6 ± 0.3, responsiveness 4.5 ± 0.4, and interface clarity 4.6 ± 0.2. These results indicate that all user groups found the system intuitive, fast, and reliable. The analysis confirms the system's effectiveness in reducing manual work, improving payroll accuracy, and ensuring usability across different organizational roles.

Compared to previous payroll information system studies, the developed system demonstrates higher user satisfaction and broader functionality. While most existing studies focused primarily on attendance and basic payroll computation, this research integrates reimbursement, loan management, and decision-support features for salary adjustments. The achieved satisfaction score of 90.8% indicates stronger usability and performance, emphasizing the system's novelty and effectiveness in improving payroll efficiency and overall user experience.

Feedback

In designing and building a payroll system at the Company, there are several hopes and desires from users regarding the features and functionality of the application to meet existing needs. Users hope that this application is easy to operate by various users in the company, such as HRD, admin, and company director, without requiring special training, besides that all features have functioned well without any errors. However, there is feedback given by users regarding functionality and usage. In general, the following are the desires for functionality and usage of this application that get feedback from users:

1. In functionality, users expect that there will be no data similarities when there is data similarity. The implemented solution involves the system generating a notification when a duplicate username is detected in the database, informing the user that the entered data has already been used.
2. In use, users hope that no errors occur in the system when the system is used. If this happens, the solution is to check for system errors and be informed about the errors that occur.

Discussion

The database design for the employee payroll system consists of 18 entities that manage monthly transaction data, with an estimated total storage requirement of 83.77 KB per month. This compact size demonstrates that the system is highly

Accredited Rank 2 (Sinta 2) based on the Decree of the Dirjen Penguatan RisBang Kemenristekdikti No.225/E/KPT/2022, December 07, 2022. Published by LPPM Universitas Nusa Mandiri

VOL. 11. NO. 3 FEBRUARI 2026
P-ISSN: 2685-8223 | E-ISSN: 2527-4864
DOI: 10.33480/jitk.v11i3.7044

efficient in handling payroll data and scalable for organizations with limited infrastructure. Compared with similar payroll system implementations in prior studies, which required higher storage due to non-normalized structures, this design optimizes both space and performance. The UAT results showed a total score of 454 out of 500 (90.8%), placing the system in the "Highly Eligible" category. This level of user satisfaction indicates that the system meets usability and reliability expectations across different organizational roles. When compared to earlier payroll system evaluations that achieved average user satisfaction between 80–88%, the proposed system demonstrates higher acceptance, reflecting improvements in interface clarity, data accuracy, and system responsiveness.

Feedback gathered from users also provides valuable insights for refinement. Functionality-wise, users highlighted the importance of avoiding duplicate data entries, which has been addressed by implementing a duplicate-detection alert for username registration. Additionally, to enhance system reliability, users suggested more transparent error-handling mechanisms that notify users of system errors in real time. These improvements emphasize the importance of continuous iteration and user-centered design in developing payroll systems that align with business operations. Overall, the discussion confirms that the proposed system not only fulfills its technical objectives but also offers measurable advantages in data efficiency and user satisfaction compared with related systems. Future work may extend the integration of the AHP MAUT module for salary adjustment analysis to further strengthen decision-making features and system intelligence.

CONCLUSION

This study successfully developed a structured web-based payroll information system using the Prototyping method and the Database System Development Life Cycle (DSDLC). The integration of key payroll functions within a centralized platform proved effective in improving accuracy, efficiency, and data transparency. Based on User Acceptance Testing (UAT), the system achieved a 90.8% satisfaction rate, indicating strong user approval and system reliability compared to manual Excel-based payroll processes. These findings highlight that combining iterative prototyping and structured database design enhances payroll performance and reduces human error. The research contributes to the field of payroll management systems by offering an applied framework for developing adaptive and user-oriented payroll solutions. Future enhancements may include integrating leave management and advanced security mechanisms to further strengthen scalability, compliance, and interoperability with financial systems.

REFERENCE

[1] J. Ribeiro, R. Lima, T. Eckhardt, and S. Paiva, "Robotic Process Automation and Artificial Intelligence in Industry 4.0 – A Literature review," *Procedia Comput. Sci.*, vol. 181, pp. 51–58, 2021, doi: https://doi.org/10.1016/j.procs.2021.01.104.

[2] C. Flechsig, F. Anslinger, and R. Lasch, "Robotic Process Automation in purchasing and supply management: A multiple case study on potentials, barriers, and implementation," *Journal of Purchasing and Supply Management*, vol. 28, no. 1, p. 100718, 2022, doi: https://doi.org/10.1016/j.pursup.2021.100718.

[3] Z. Yu, X. Cao, L. Tang, T. Yan, and Z. Wang, "Does digitalization improve supply chain efficiency?," *Financ. Res. Lett.*, vol. 67, p. 105822, 2024, doi: https://doi.org/10.1016/j.frl.2024.105822.

[4] X. Liu, F. Cheng, R. Zhang, and Z. Li, "Impact of employee compensation structure on company performance: Moderating effects of ownership concentration," *Financ. Res. Lett.*, vol. 74, p. 106702, 2025, doi: https://doi.org/10.1016/j.frl.2024.106702.

[5] F. Ohunakin and O. A. Olugbade, "Do employees' perceived compensation system influence turnover intentions and job performance? The role of communication satisfaction as a moderator," *Tour. Manag. Perspect.*, vol. 42, p. 100970, 2022, doi: https://doi.org/10.1016/j.tmp.2022.100970.

[6] K. A. Obayes and A. Hamzah, "Using of prototyping in develop an employee information management," *Measurement: Sensors*, vol. 24, p. 100557, 2022, doi: https://doi.org/10.1016/j.measen.2022.100557.

[7] J. Tang and J. Feng, "Collecting system and payroll tax compliance: Evidence from Chinese firm-level data," *China Economic Quarterly International*, vol. 1, no. 2, pp. 135–147, 2021, doi:

https://doi.org/10.1016/j.ceqi.2021.04.001.

[8] N. F. Mosha and P. Ngulube, "Metadata Standard for Continuous Preservation, Discovery, and Reuse of Research Data in Repositories by Higher Education Institutions: A Systematic Review," Aug. 01, 2023, *Multidisciplinary Digital Publishing Institute (MDPI)*. doi: 10.3390/info14080427.

[9] B.-T. Nguyen-Tat, M.-Q. Bui, and V. M. Ngo, "Automating attendance management in human resources: A design science approach using computer vision and facial recognition," *International Journal of Information Management Data Insights*, vol. 4, no. 2, p. 100253, 2024, doi: https://doi.org/10.1016/j.jjimei.2024.100253.

[10] I. G. N. K. Bramastha, S. A. Wicaksono, and A. D. Herlambang, "Pengembangan Database E-Learning PT XYZ menggunakan Metode Database System Development Life Cycle," *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer*, vol. 7, no. 5, pp. 2469–2474, Aug. 2023, [Online]. Available: https://j-ptiik.ub.ac.id/index.php/j-ptiik/article/view/12685

[11] A. M. Ahmed, C. N. Mohammed, and A. M. Ahmad, "Web-based payroll management system: design, implementation, and evaluation," *Journal of Electrical Systems and Information Technology*, vol. 10, no. 1, Mar. 2023, doi: 10.1186/s43067-023-00082-5.

[12] A. I. Irawan and Komarudin Tasdik, "Web Based Payroll Information System Using CodeIgniter at the Regional Secretariat Tasikmalaya Regency," *Journal of Artificial Intelligence and Engineering Applications (JAIEA)*, vol. 4, no. 1, pp. 10–16, Oct. 2024, doi: 10.59934/jaiea.v4i1.538.

[13] D. Firmansyah and A. Voutama, "Desain Ui/Ux Aplikasi Mobile Pemesanan Makanan Online: Prototyping Menggunakan Figma Dengan Metode Kiss," *Jurnal Informatika dan Teknik Elektro Terapan*, vol. 13, no. 2, Apr. 2025, doi: 10.23960/jitet.v13i2.6419.

[14] N. Hiu and Y. Erlyana, "Redesigning User Interface of Datascripmall Mobile Apps Using User Centered Design Method," *Teknika*, vol. 13, no. 2, pp. 283–292, Jul. 2024, doi: 10.34148/teknika.v13i2.854.

[15] M. Susanto, M. E. Johan, A. Sulaiman, and M. I. Fianty, "Web-Based Assignment Information System Serves to Improve Economic Research at Universities and Public Services," *Jurnal Informatika Ekonomi Bisnis*, pp. 171–176, Feb. 2024, doi: 10.37034/infeb.v6i1.824.

[16] D. Chapela-Campa, I. Benchekroun, O. Baron, M. Dumas, D. Krass, and A. Senderovich, "A framework for measuring the quality of business process simulation models," *Inf. Syst.*, vol. 127, p. 102447, 2025, doi: https://doi.org/10.1016/j.is.2024.102447.

[17] F. Taymouri, M. La Rosa, M. Dumas, and F. M. Maggi, "Business process variant analysis: Survey and classification," *Knowl. Based. Syst.*, vol. 211, p. 106557, 2021, doi: https://doi.org/10.1016/j.knosys.2020.106557.

[18] K. Lashkevich, F. Milani, D. Chapela-Campa, I. Suvorau, and M. Dumas, "Unveiling the causes of waiting time in business processes from event logs," *Inf. Syst.*, vol. 126, p. 102434, 2024, doi: https://doi.org/10.1016/j.is.2024.102434.

[19] J. V. G. de Oliveira, E. A. Portela Santos, and S. P. Detro, "Uncovering the potential and pitfalls of Process Mining in manufacturing," *Procedia CIRP*, vol. 132, pp. 19–24, 2025, doi: https://doi.org/10.1016/j.procir.2025.01.004.

[20] N. Nawaz, H. Arunachalam, B. K. Pathi, and V. Gajenderan, "The adoption of artificial intelligence in human resources management practices," *International Journal of Information Management Data Insights*, vol. 4, no. 1, p. 100208, 2024, doi: https://doi.org/10.1016/j.jjimei.2023.100208.

[21] W. M. P. van der Aalst, H. A. Reijers, and L. Maruster, "Process mining beyond workflows," *Comput. Ind.*, vol. 161, p. 104126, 2024, doi: https://doi.org/10.1016/j.compind.2024.104126.

[22] U. Murugesan, P. Subramanian, S. Srivastava, and A. Dwivedi, "A study of Artificial Intelligence impacts on Human Resource Digitalization in Industry 4.0," *Decision Analytics Journal*, vol. 7, p. 100249, 2023, doi: https://doi.org/10.1016/j.dajour.2023.100249.

[23] S.-H. Wang, "Enhancing Control of Engineering Worker-hours Using Semantic Analysis Model," *Results in Engineering*, vol. 15, p. 100505, 2022, doi: https://doi.org/10.1016/j.rineng.2022.100505.

[24] Y. Mothanna, W. ElMedany, M. Hammad, R. Ksantini, and M. S. Sharif, "Adopting security practices in software development process: Security testing framework for sustainable smart cities," *Comput. Secur.*, vol. 144, p. 103985, 2024, doi: https://doi.org/10.1016/j.cose.2024.103985.

[25] D. Tissen, I. Wiederkehr, C. Koldewey, and R. Dumitrescu, "Data from start to finish: A System Life Cycle Data Map," *Procedia CIRP*, vol. 122, pp. 413–418, 2024, doi: https://doi.org/10.1016/j.procir.2024.01.060.

[26] C. Wohner, J. Peterseil, and H. Klug, "Designing and implementing a data model for describing environmental monitoring and research sites," *Ecol. Inform.*, vol. 70, p. 101708, 2022, doi: https://doi.org/10.1016/j.ecoinf.2022.101708.

[27] M. G. Guillemette, S. Frechette, and A. Moïse, "Comparing Requirements Analysis Techniques in Business Intelligence and Transactional Contexts:," *International Journal of Business Intelligence Research*, vol. 12, no. 2, 2021, doi: https://doi.org/10.4018/IJBIR.294569.

[28] P. Yin and J. Cheng, "A MySQL-Based Software System of Urban Land Planning Database of Shanghai in China," *CMES - Computer Modeling in Engineering and Sciences*, vol. 135, no. 3, pp. 2387–2405, 2022, doi: https://doi.org/10.32604/cmes.2023.023666.

[29] R. Kamal, E. E.-D. Hemdan, and N. El-Fishway, "Care4U: Integrated healthcare systems based on blockchain," *Blockchain: Research and Applications*, vol. 4, no. 4, p. 100151, 2023, doi: https://doi.org/10.1016/j.bcra.2023.100151.

[30] V. B. Hadikin and J. Wiratama, "Web-Based ERP System Prototype for Enhanced Inventory and Supply Chain Management in the Logistics Industry," *Ultima Infosys : Jurnal Ilmu Sistem Informasi*, vol. 15, no. 2, 2024.

[31] T. Taipalus, "Database management system performance comparisons: A systematic literature review," *Journal of Systems and Software*, vol. 208, p. 111872, 2024, doi: https://doi.org/10.1016/j.jss.2023.111872.

[32] M. Fotache, M.-I. Cluci, T. Taipalus, and G. Talaba, "The effects of database normalization on decision support system performance," *Inf. Syst.*, vol. 136, p. 102636, 2026, doi: https://doi.org/10.1016/j.is.2025.102636.

[33] D. Octavian and M. Shoily, "Using Databases in Decision Systems for Businesses Original Article Using Databases in Decision Systems for Businesses: A Review," *International Journal of Data Science and Analysis*, vol. Volume 2, pp. 15–20, Jul. 2025.

[34] E. Bjarnason, F. Lang, and A. Mjöberg, "An empirically based model of software prototyping: a mapping study and a multi-case study," *Empir. Softw. Eng.*, vol. 28, no. 5, Sep. 2023, doi: 10.1007/s10664-023-10331-w.

[35] A. A. Yunanto *et al.*, "Design and Implementation the Prayer Reminder Application using KISS Principle based on User Centered Design," *Procedia Comput. Sci.*, vol. 234, pp. 1484–1491, 2024, doi: https://doi.org/10.1016/j.procs.2024.03.149.

[36] M. C. Neff *et al.*, "Development and expert inspections of the user interface for a primary care decision support system," *Int. J. Med. Inform.*, vol. 192, p. 105651, 2024, doi: https://doi.org/10.1016/j.ijmedinf.2024.105651.

[37] T. B. dos Santos, C. Campese, R. M. Marcacini, R. A. Sinoara, S. O. Rezende, and J. Mascarenhas, "Prototyping for user involvement activities: How to achieve major benefits," *CIRP J. Manuf. Sci. Technol.*, vol. 33, pp. 465–472, 2021, doi: https://doi.org/10.1016/j.cirpj.2021.04.013.

[38] S. Astfalk, J. Silberer, P. Planing, and P. Müller, "The effect of a functional prototype on user acceptance in transportation: Assessing the level of acceptance before and after the first demonstration flight of an air taxi," *Transp. Res. Interdiscip. Perspect.*, vol. 11, p. 100444, 2021, doi: https://doi.org/10.1016/j.trip.2021.100444.