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Original article

eHRSMAM: Integrated HR System with Multi-Modal Attendance Monitoring

Ivie C. Paco[1*], Domingo V. Origines Jr.[2]
[1]College of Computing, Engineering and Technology, Davao del Sur State College, Brgy. Matti, Digos City, Davao del Sur 8002, Philippines
[2] College of Computing, Engineering and Technology, Davao del Sur State College, Brgy. Matti, Digos City, Davao del Sur 8002, Philippines
**Corresponding author: Iviepaco@dssc.edu.ph*

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Abstract: This study, titled *eHRMAM: An Integrated HR System with Multi-Modal Attendance Monitoring*, introduces a web-based solution aimed at improving attendance management and strengthening disciplinary accountability. The project focuses on the shortcomings of the company's manual logbook attendance system, which frequently resulted in illegible records, duplicate offenses, and inaccurate documentation of penalties. To address these challenges, the system incorporates QR code scanning and biometric verification technologies to ensure precise, secure, and dependable employee attendance monitoring. Developed using the Rapid Application Development (RAD) methodology, the system emphasizes a user-centric approach and enables rapid iterations based on user feedback. Key features include real-time attendance tracking, automated computation of penalties and rewards, leave management, and data visualization tools for administrative analysis. The system was evaluated by twenty (20) selected respondents using the ISO 25010:2011 Software Quality Model, achieving high ratings in functionality (4.43), performance efficiency (4.30), and usability and reliability (3.96), with an overall mean of 4.16 (Agree). Results indicate that the system enhances operational efficiency in HR processes, particularly in attendance and disciplinary monitoring. However, the study is limited by its pilot-scale deployment, reliance on perception-based evaluation, and absence of objective performance benchmarks or inferential statistical analysis. Future research is recommended to involve larger and more diverse user groups, incorporate quantitative performance metrics, conduct baseline comparisons with existing systems, and apply rigorous statistical validation to strengthen generalizability and research contribution. Additionally, expanding the system to support advanced analytics and broader organizational contexts may further enhance its applicability. The initiative supports the United Nations Sustainable Development Goal 8 (Decent Work and Economic Growth) by promoting efficient, transparent, and technology-enabled human resource practices for organizations transitioning from manual to digital HR systems.

Keywords: *multi-factor attendance authentication, human resource management system, attendance monitoring, biometric attendance*

Introduction

Attendance is an important way to track who is present and participating in both schools and workplaces (Pertiwi *et al*., 2023). It is also a key tool for judging performance, maintaining order, and ensuring that rules are followed. Accurate attendance records support productivity and fairness. However, inconsistencies can cause problems, waste time, and lead to poor management. Manual attendance methods, including paper logbooks, often have significant problems, such as illegible handwriting, lost records, repeated infractions, and inconsistent enforcement of punishments (Roosdianto *et al*., 2021). These issues not only slow data collection and verification but also undermine the reliability of attendance records, which are important for decision-making and employee evaluation.

To address these issues, Ayu and Mustafa (2019) emphasize the rise of digital attendance solutions that leverage contemporary technologies such as Android-based scanners and Radio Frequency Identification (RFID) systems to modernize and automate the attendance process (Umar *et al*., 2023). These technologies have been shown to work well for attendance management by improving accuracy, reducing human involvement, and increasing efficiency. Many businesses still use traditional manual processes, even though they have their benefits. These systems nonetheless make it harder for businesses to be efficient and transparent.

Furthermore, the existing manual attendance procedure at Pioneer Amaresa Inc. has resulted in recurring issues, including data entry errors, inaccurate computation of absences and tardiness, inconsistent disciplinary actions, employee misunderstandings, and administrative inefficiencies. From the perspective of Human Resource Information Systems (HRIS) theory, such limitations reflect the inability of manual systems to support accurate data processing, timely information access, and effective decision-making. Anchored in technology adoption frameworks such as the Technology Acceptance Model (TAM) and socio-technical systems theory.

Moreover, the existing manual attendance procedure at Pioneer Amaresa Inc. has led to recurring challenges, including data-entry errors, inaccurate calculations of absences and tardiness, inconsistent disciplinary actions, employee misunderstandings, and administrative inefficiencies. These issues are consistent with prior studies, which indicate that manual HR processes often lead to operational errors, delays in information, and reduced decision-making efficiency (Alenezi *et al*., 2020; Marler & Parry, 2016). From the perspective of Human Resource Information Systems (HRIS) theory, such limitations underscore the inability of traditional systems to provide timely, accurate, and integrated HR data that supports effective organizational decision-making (Kavanagh *et al*., 2015).

The development of the eHRMAM System aims to address these gaps by enhancing perceived usefulness, reliability, and system integration. By employing QR code scanning and biometric authentication, the system automates attendance tracking, ensures data accuracy, strengthens disciplinary monitoring, and improves organizational transparency by providing comprehensive visibility into attendance patterns across departments. The project also added important features that improved both employee and administrative

work. It allows employees to manage their own accounts, view daily time records, track penalties and rewards, and request time off through the system. It also gave administrators the tools needed to monitor attendance statistics, analyze and approve leave requests, and generate detailed reports using interactive data visualization. The technology also sent automatic reminders to let employees know about their penalty status, which made attendance management more transparent and efficient. Likewise, this study is guided by a conceptual framework grounded in the DeLone and McLean Information Systems Success Model, which links system quality, information quality, and service quality to system use, user satisfaction, and organizational impact (DeLone *et al.*, 2003). Within this framework, system quality informed the design of reliable and secure modules such as user account management, automated attendance tracking, penalty notifications, and role-based access for employees and administrators. Information quality guided the development of accurate daily time records, transparent tracking of penalties and rewards, and interactive data visualization tools that support administrative reporting and analysis. Service quality shaped the inclusion of self-service features, including leave request processing and administrative approval workflows, to enhance responsiveness and usability. The framework also directed the system evaluation by aligning these design components with quality dimensions such as functionality, performance efficiency, usability, and reliability, thereby assessing both user satisfaction and operational effectiveness. Through this conceptual lens, the system demonstrates how high-quality information systems can improve attendance transparency, streamline HR processes, and support informed decision-making at both employee and administrative levels. Figure 1 shows the project's conceptual framework, which includes its main parts and the steps needed to reach these goals.

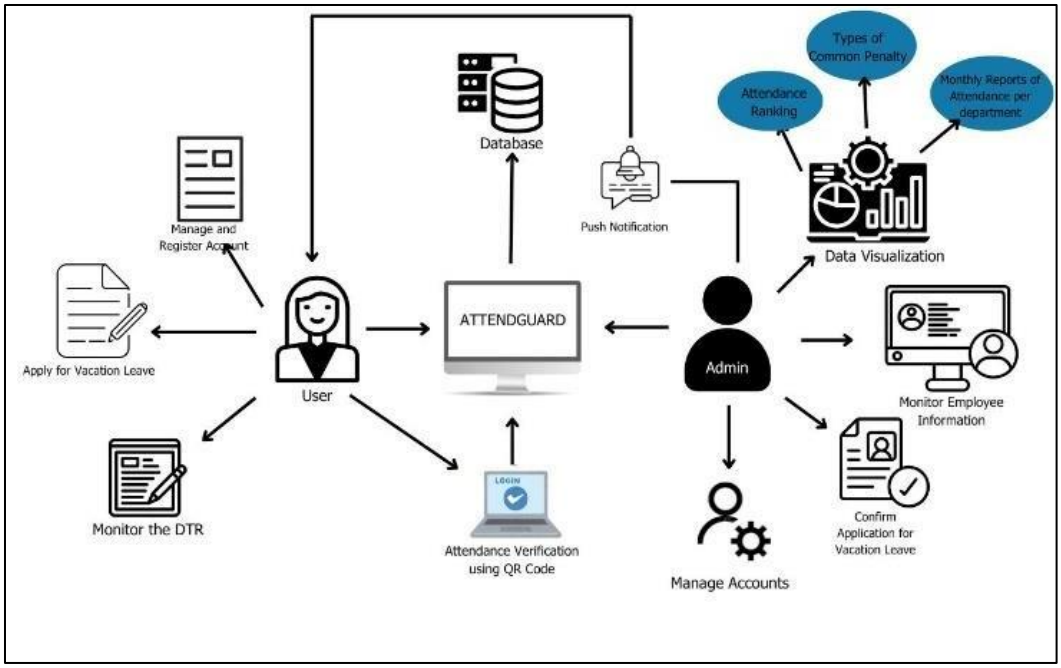


Figure 1. Conceptual Framework of the Study

Methods and Materials Used

The materials and methods used in the project include the capstone locale, the Rapid Application Development (RAD) model, the hardware specifications, the data used, the Entity Relationship Diagram (ERD) and Dataflow Diagram (DFD), the distribution of respondents, and the Likert Scale used for evaluation.

Capstone Locale

A capstone locale is the location or setting where a capstone project takes place. Figure 2 shows that this research was conducted at Pioneer Amaresa Inc., located in Brgy. San Vicente, Makilala, North Cotabato. This location served as the data source for collecting and evaluating the development process of the EHRSMAM.

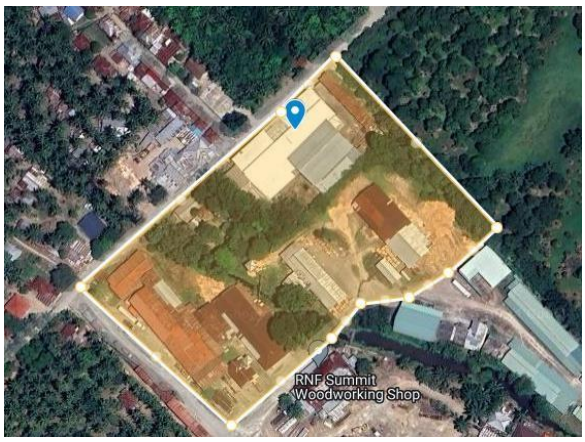


Figure 2. *Research Locale of the Study*

System Design

System design serves as a blueprint for a system's components, interfaces, and data, facilitating the identification and resolution of potential issues throughout the research and analysis phases. Figure 3 illustrates the research design used in the system. This study identified the model as the most suitable software development methodology because it accommodates projects that require frequent prototype modifications until user satisfaction is achieved.

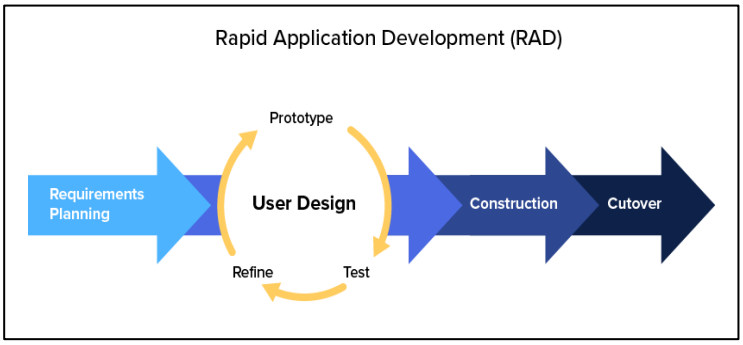


Figure 3. *Rapid Application Development of the Study*

Utilized Hardware and Data

During development and testing, the system was built with appropriate hardware components to ensure smooth and efficient operation. The specifications and hardware details of the items used for the system' s reliable deployment and execution relied on mid-range computer hardware, which prevented performance deterioration and operational failure. The primary development tool was a laptop with a 128 GB SSD, 4 GB of RAM, and an Intel Pentium Silver 11 th Generation 1115 G 4 processor operating at 3 GHz. This configuration' s ample processing power and storage space successfully handled database operations, software execution, and user interface rendering.

Furthermore, to enhance the accuracy, security, and reliability of attendance authentication, the system incorporated both fingerprint biometric scanning and QR code verification. Biometric authentication ensures that attendance records are uniquely linked to each employee, minimizing the risk of proxy attendance or errors associated with manual entry. The selected device featured a 16 × 16 mm active scan area, supported up to 600 users, and had a transaction storage capacity of 100, 100,000 entries, ensuring efficient processing even under high usage. Complementing biometrics, QR code scanning provides a fast, user- friendly, and low- contact method for attendance recording, which increases efficiency while maintaining security.

The combination of these two technologies allows the eHRMAM system to leverage the strengths of each method—high security and identity verification from biometrics, and convenience and speed from QR codes—to ensure dependable and transparent attendance tracking. Staff records and attendance logs from Pioneer Amaresa Inc. served as the primary dataset for the system's development, enabling rigorous testing, validation, and optimization of functionalities related to human resource management and attendance monitoring. The backend design relied on a structured SQL database (eHRMAM), comprised of twelve interconnected tables that manage employee data, attendance, leave, penalties, and rewards. This organized database structure ensures data integrity, consistency, and efficient retrieval, supporting the smooth operation of all system functionalities.

Entity Relationship Diagram (ERD) of the System

An Entity-Relationship Diagram (ERD) is a visual representation of the system’s data structure, showing how entities, their attributes, and relationships are organized to support system operations. It provides a conceptual map for the database design, ensuring efficient data flow and integration across modules. The ERD for the eHRMAM system, shown in Figure 4, highlights the relationships among core entities that enable comprehensive attendance monitoring and HR management.

At the center of the database is the User table, which stores essential employee information such as employee ID, full name, department, position, and contact details. This table serves

as the primary hub, linking all other entities and ensuring that operational and administrative processes are accurately associated with individual employees. Connected to the User table are the Attendance and Leave tables. The Attendance table records daily time-in and time-out logs, along with QR code and biometric authentication details, ensuring reliable verification of employee presence. The Leave table tracks leave applications, approval status, and leave balances, enabling administrators to efficiently process requests and maintain compliance with HR policies.

Disciplinary actions and rewards are managed through the Penalty and Rewards tables, which store details of infractions, penalties applied, commendations, and bonus allocations. These tables are linked to the User table to associate each record with the corresponding employee, allowing the system to automate calculations and generate personalized reports. The Department table defines organizational units and links users to their respective divisions, facilitating aggregated reporting and departmental analysis. Finally, relational attributes such as foreign keys ensure that all tables are synchronized, maintain data consistency, and prevent redundancy.

This structured hierarchy allows the system to perform complex HR operations, including profile management, attendance tracking, leave administration, and disciplinary monitoring, in an integrated manner. By connecting biometric and QR code authentication records with employee IDs, the ERD guarantees accurate and secure data capture. Overall, the ERD provides a stable, scalable, and well-organized database foundation that supports the functionality, reliability, and efficiency of the eHRMAM system.

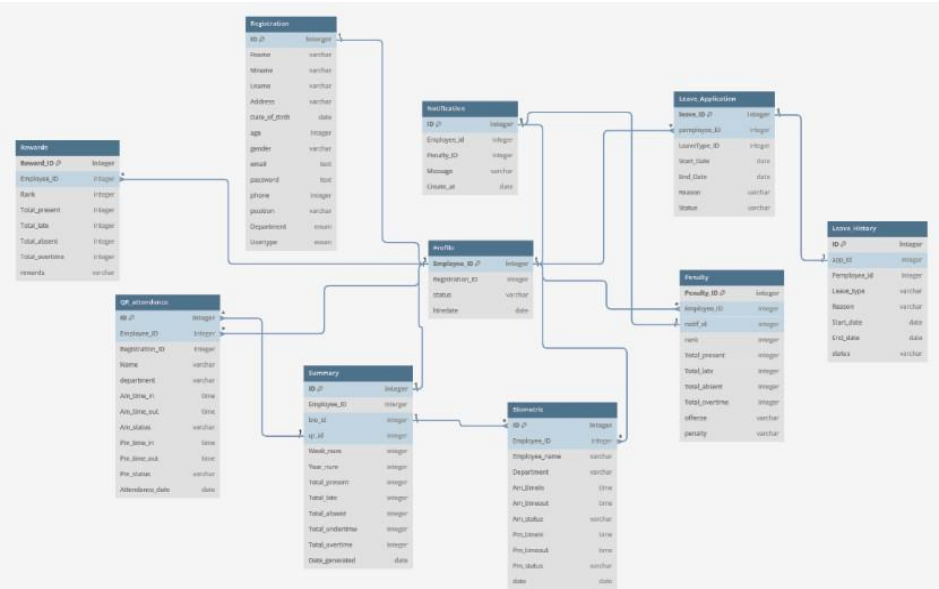


Figure 4. *ERD Diagram of the System*

Data Flow Diagram (DFD) of the System

Figures 5 and 6 present the Data Flow Diagrams (DFDs) for the admin and user roles, respectively, showing how data moves through the eHRMAM system. The DFDs provide

a visual overview of the system's processes, data stores, and interactions with external entities, clarifying the logical flow of information.

For the user role, the DFD shows that employees can log attendance, track penalties and rewards, and submit leave applications. When an employee scans a QR code or uses the biometric scanner, the system captures the attendance data and stores it in the Attendance database. Leave requests are processed through the Leave module, where they await approval from the admin. Similarly, penalty and reward updates are recorded in the system and made accessible to users through their accounts, providing transparency and real-time feedback.

For the admin role, the DFD emphasizes higher-level control and oversight. Administrators are responsible for creating and managing user accounts, reviewing attendance logs, approving leave applications, updating penalty and reward records, and generating comprehensive reports. User data flows into administrative processes, where it is validated, processed, and stored in relevant databases. Reports and visualizations are then generated from aggregated data and made accessible to management or decision-makers.

Overall, the DFDs ensure that all inputs, processes, and outputs are logically structured, illustrating how the system supports role-based operations, data integrity, and efficient processing. The diagrams clarify interactions between system modules, showing how user actions trigger processes, how data is stored and retrieved, and how information flows back to users and administrators, ensuring accountability, transparency, and effective HR management. By explicitly mapping these flows, the DFDs serve as a foundational guide for system development, testing, and future enhancements.

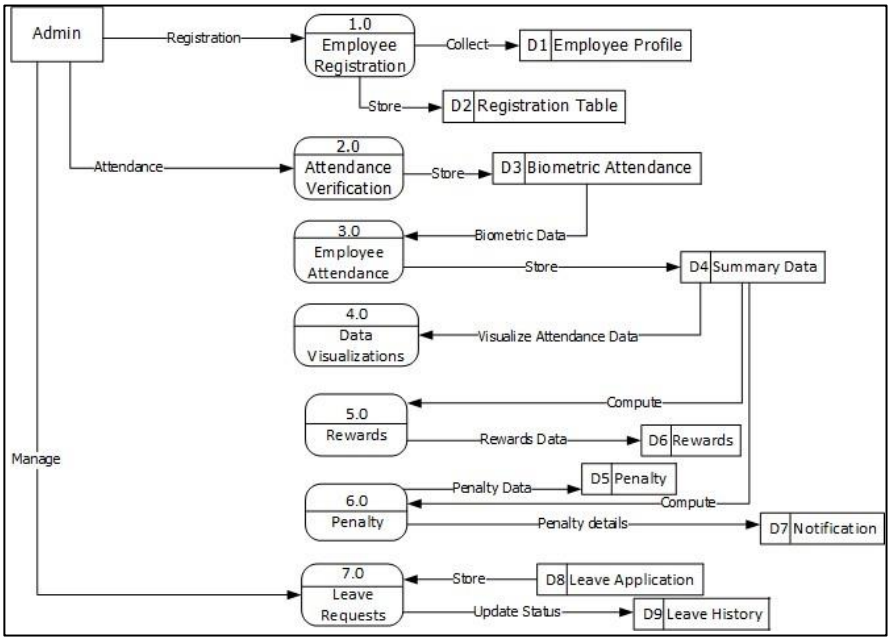


Figure 5*. Data Flow Diagram of Admin*

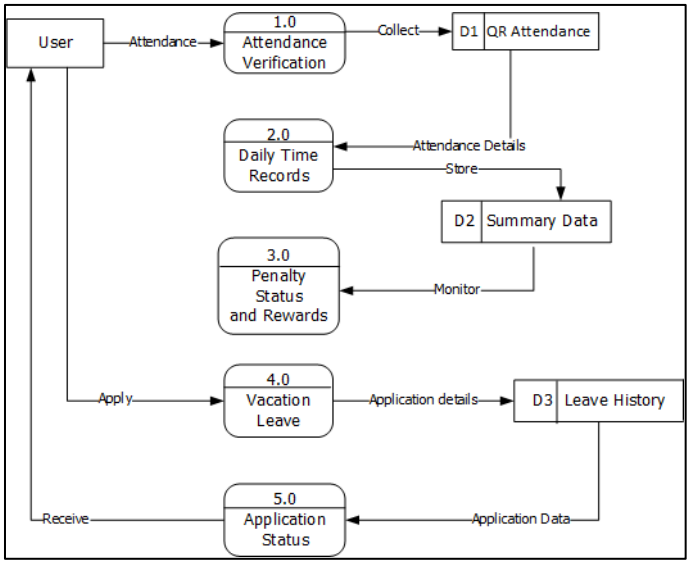


***Figure 6**. Data Flow Diagram of User*

Respondent of the Study

A stratified random sampling method was employed to identify the twenty (20) respondents who evaluated the system in terms of functionality, reliability, and usability, using a questionnaire adapted from the International Organization for Standardization's (ISO) Software Quality Model 25010:2011. Table 1 presents the distribution of participants involved in the study. Respondents were selected to represent all relevant stakeholder groups, including fourteen (14) employees randomly chosen from various departments, three (3) HR personnel, and three (3) panel members with expertise in system evaluation. Stratification ensured that each subgroup of users was proportionally represented, providing a comprehensive assessment of the system from different perspectives. While the sample size is relatively small, twenty participants are considered sufficient for user testing and usability evaluation, as prior studies in software usability suggest that a sample of 15–25 users can effectively identify most usability issues and provide meaningful feedback. The combination of stratified sampling and targeted participant selection enhanced the reliability and validity of the evaluation, ensuring that insights reflect both everyday users and administrative or expert perspectives.

***Table 1.** Distribution of Respondents*

Evaluators	Sample Size
Employees	14
Human Resource Dept.	3
Advisory Panell	3
Total	**20**

Likert Scale of Measurements for Functional Suitability, Performance Efficiency, Reliability, Usability, and Compatibility

To evaluate system performance, a 5-point Likert scale based on the ISO 25010 model was used to measure functionality, usability, performance efficiency, and reliability, where 5 means "Strongly Agree" and 1 means "Strongly Disagree" see Table 2 for more details. This structured methodology ensured that the system was practical, efficient, and aligned with actual workplace needs.

***Table 2**. Likert Scale of Measurement for Functional Suitability, Performance Efficiency, Reliability, Maintainability, Portability, and Usability*

Mean Range	Descriptive Equivalent	Interpretation
4.51–5.00	Strongly Agree	This measure indicates that the respondents are convinced that all aspects regarding the functional Suitability, performance efficiency, reliability, usability, and compatibility of the system have been successfully met, and no errors.
3.5 1–4.50	Agree	This measure indicates that the results are acknowledged by the respondents despite the functional suitability, performance efficiency, reliability, usability, and compatibility objectives not entirely achieved and there could be minor issues that are present such as bugs, and malfunctions.
2.51– 3.50	Fairly Agree	This measure indicates that the results are accepted by the respondents and assumes that the objectives have been met somehow. However, some functional suitability, performance efficiency, reliability, usability, and compatibility may not be completely satisfactory for the respondents.
1.51–2.50	Disagree	This measure indicates that the results made the respondents think that almost all the objectives were not fulfilled.
1.00–1.50	Strongly Disagree	This measure indicates that the respondents were not convinced that the objectives were fulfilled by the system.

Privacy, Security Measures, and Compliance with the Data Privacy Act

In the development and implementation of eHRMAM: Integrated HR System with Multi-Modal Attendance Monitoring, ensuring data privacy, security, and regulatory compliance was a key consideration due to the sensitive nature of employee information, including personal identifiers, attendance records, penalties, rewards, and biometric data. The system incorporates several technical and administrative measures to safeguard this information. Role-based access control (RBAC) ensures that only authorized personnel can access specific modules, such as attendance logs, leave approvals, or HR reports, minimizing the risk of unauthorized disclosure. Data encryption is employed both in storage and during transmission, protecting sensitive records from interception or tampering. Additionally, the use of multi-factor authentication, including QR code verification and fingerprint biometrics, enhances identity verification and reduces the potential for fraudulent access.

The system also aligns with the Philippine Data Privacy Act of 2012 (Republic Act No. 10173), which mandates the protection of personal and sensitive personal information. In compliance with this law, eHRMAM enforces policies for limited data collection, purpose specification, and secure retention, ensuring that biometric and attendance data are collected only for legitimate HR purposes and stored for the minimum period necessary.

Regular audit trails and system logs provide traceability of data access and modifications, supporting accountability and transparency. Users are also informed of the purpose and scope of data collection, in accordance with privacy principles such as consent, transparency, and data minimization.

Furthermore, the adoption of a secure, structured SQL database and potential migration to a cloud-based environment with proper security protocols enhances disaster recovery, backup, and protection against data loss. These privacy and security measures collectively ensure that eHRMAM not only provides efficient HR and attendance monitoring but also maintains trust, compliance, and integrity in handling sensitive employee information, thereby supporting both organizational accountability and employee confidence in the system.

Results and Discussion

This chapter presents a detailed overview and discussion of each user interface (UI) of the capstone project EHRSMAM: Integrated HR System with Multi-Modal Attendance Monitoring. It summarizes key goals, outcomes, and relevant details. The results align with expectations and aim to contribute to existing knowledge and support future research on the topic.

Admin Account Module in Registering Account

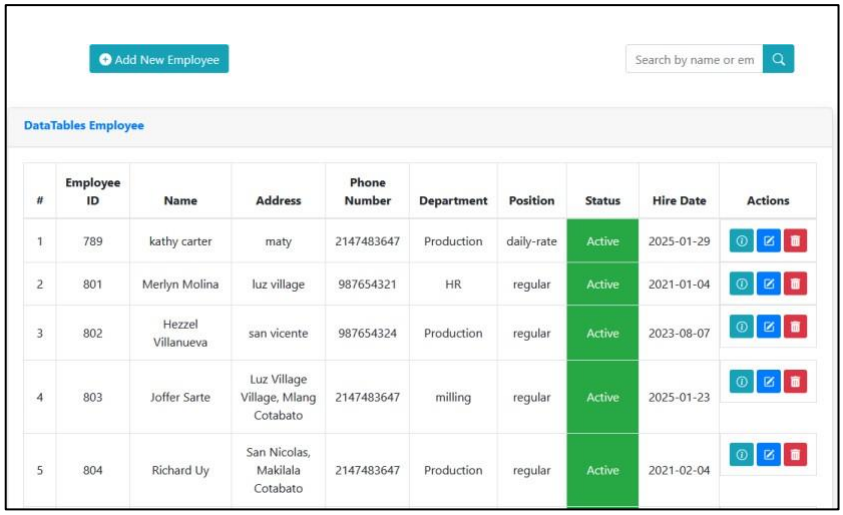
Figure 7 enables the admin to register, view, edit, and delete user accounts stored in the database. The user management interface displays a table of employee details, including ID, name, contact information, and user type, with action buttons for modifying or removing records.



Figure 7. *GUI of Admin Register Account*

Admin Account on Monitoring Employee Data

Figure 8 displays the admin managing employee data using CRUD operations, enabling them to add, edit, or delete records stored in the database.

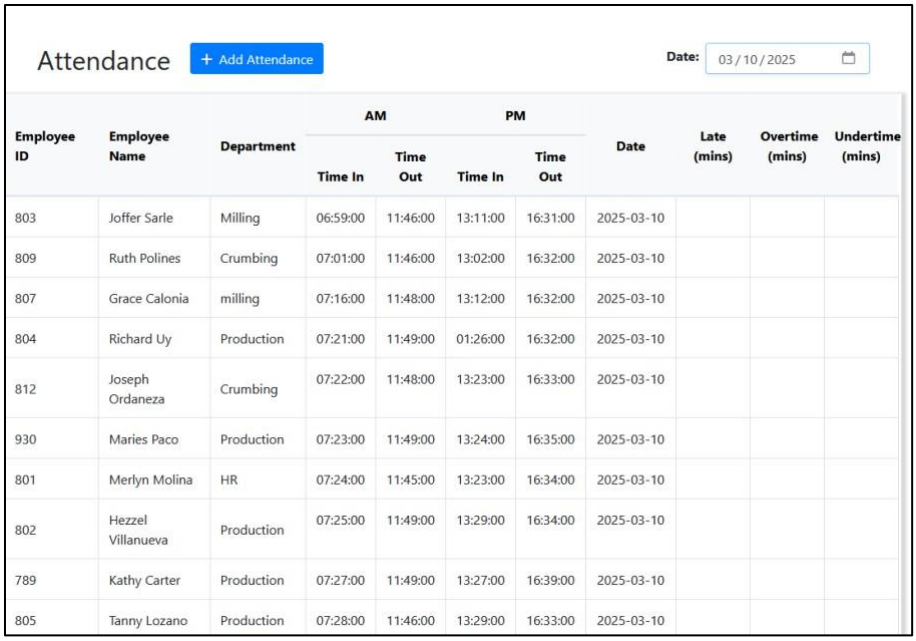


#	Employee ID	Name	Address	Phone Number	Department	Position	Status	Hire Date	Actions
1	789	kathy carter	maty	2147483647	Production	daily-rate	Active	2025-01-29	
2	801	Merlyn Molina	luz village	987654321	HR	regular	Active	2021-01-04	
3	802	Hezzel Villanueva	san vicente	987654324	Production	regular	Active	2023-08-07	
4	803	Joffer Sarte	Luz Village Village, Mlang Cotabato	2147483647	milling	regular	Active	2025-01-23	
5	804	Richard Uy	San Nicolas, Makilala Cotabato	2147483647	Production	regular	Active	2021-02-04	

Figure 8. *GUI for monitoring employee data using the CRUD method*

Admin Account on Monitoring Employee Daily Time Records

Figure 9 shows the admin view of employees' daily time records captured via QR code scanning. It displays attendance data by name, ID, department, and date across all departments.



Employee ID	Employee Name	Department	AM		PM		Date	Late (mins)	Overtime (mins)	Undertime (mins)
			Time In	Time Out	Time In	Time Out				
803	Joffer Sarle	Milling	06:59:00	11:46:00	13:11:00	16:31:00	2025-03-10			
809	Ruth Polines	Crumbing	07:01:00	11:46:00	13:02:00	16:32:00	2025-03-10			
807	Grace Calonia	milling	07:16:00	11:48:00	13:12:00	16:32:00	2025-03-10			
804	Richard Uy	Production	07:21:00	11:49:00	01:26:00	16:32:00	2025-03-10			
812	Joseph Ordaneza	Crumbing	07:22:00	11:48:00	13:23:00	16:33:00	2025-03-10			
930	Maries Paco	Production	07:23:00	11:49:00	13:24:00	16:35:00	2025-03-10			
801	Merlyn Molina	HR	07:24:00	11:45:00	13:23:00	16:34:00	2025-03-10			
802	Hezzel Villanueva	Production	07:25:00	11:49:00	13:29:00	16:34:00	2025-03-10			
789	Kathy Carter	Production	07:27:00	11:49:00	13:27:00	16:39:00	2025-03-10			
805	Tanny Lozano	Production	07:28:00	11:46:00	13:29:00	16:33:00	2025-03-10			

Figure 9. *GUI of Admin Monitoring Employee Daily Time Records*

Admin Account on Monitoring Penalty Status

Figure 10 shows the Penalty Monitoring Interface, which allows the administrator to monitor employee penalty records. This feature presents a detailed list of violations for each employee, including key information such as the employee ID, full name, violation type, and associated penalty as recorded in the system's database. Through this interface,

the administrator can efficiently identify employees with current penalties and track the progress of implemented disciplinary measures.

Additionally, the "Notify" icon in the Action column serves as a direct communication channel for the administrator. By clicking this option, the administrator can immediately send a notification to the relevant employee, informing them of their violation, associated penalty, or any pertinent updates. This function enhances transparency and accountability within the organization by ensuring that employees are promptly notified of their infractions and the associated disciplinary actions.

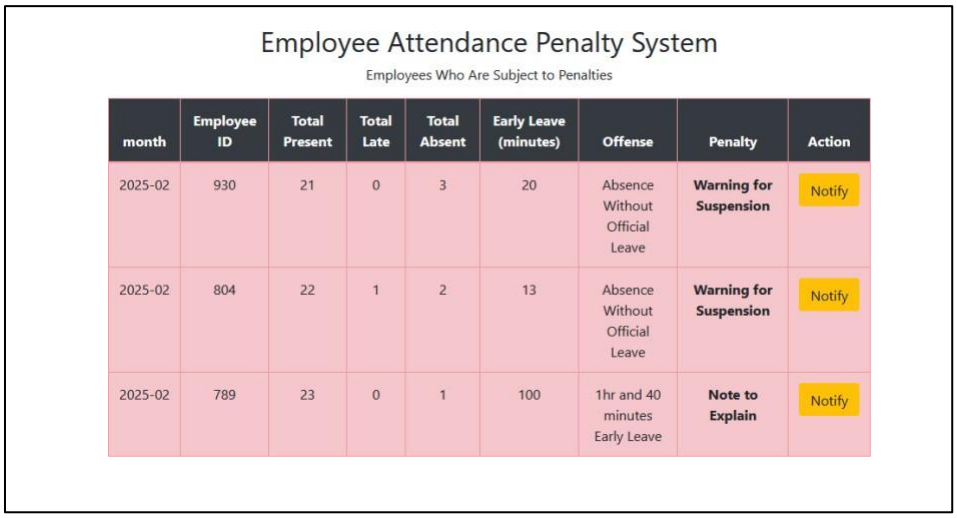


Figure 10. *GUI of Admin monitoring penalty Status*

Admin Account on Monitoring Rewards

Figure 11 illustrates the Employee Attendance Rewards Monitoring Interface, providing the administrator with a comprehensive, organized overview of all employee rewards recorded in the system. This interface displays vital information, including the employee ID, full name, rank or position, and the specific reward awarded, all retrieved from the database.

Through this feature, the administrator can effectively monitor and oversee employee accomplishments and acknowledgments within the organization. It serves as an essential instrument for fostering transparency and equity, guaranteeing that all rewards are accurately recorded and aligned with the employee's performance records. Furthermore, by consolidating reward data within a unified interface, the system streamlines performance assessment, facilitates the identification of high-performing employees, and enhances the organization’s incentive and motivation initiatives.

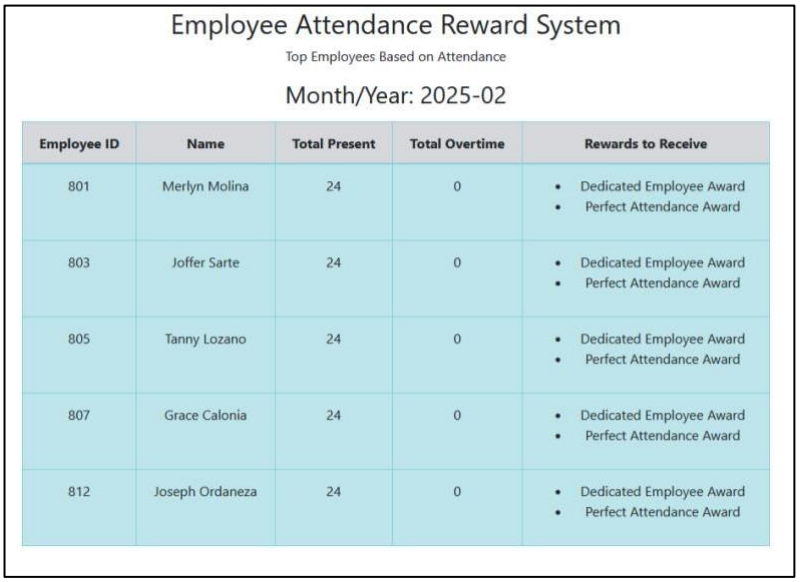


Figure 11. *GUI of the admin module monitoring rewards*

Admin account for managing Leave Application

Figure 12 shows the Leave Application Management Interface, which helps the supervisor manage and monitor employee requests for time off. This screen displays key details for each application, including the employee ID, full name, type of leave requested (such as vacation, sick, or emergency leave), the requested dates, and the current status of the application. With this feature, the admin can review all pending requests, verify that they comply with company policy, and then decide whether to approve or deny them. The interface simplifies leave management by allowing the administrator to handle multiple requests at once, reducing paperwork and the risk of errors. It also promotes transparency and accountability within the company by ensuring that all leave events are properly recorded and visible in the database. Ultimately, this function supports effective workforce planning and helps maintain even staffing levels across departments.

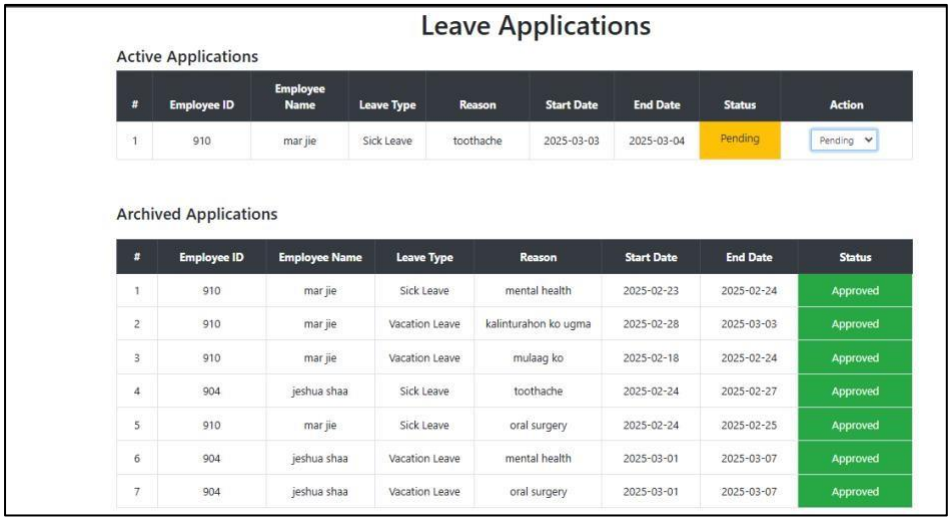


Figure 12. *GUI of Leave Application*

Admin account on Scanning QR code Attendance

Figure 13 shows the QR Code-Based Attendance Monitoring Interface. This interface lets the boss quickly and easily record employees' attendance by scanning a QR code. The system scans each employee's unique QR code to automatically record their attendance. This ensures that data entry is quick, accurate, and secure. When an employee is scanned, the system automatically saves key attendance information in a database. This includes the employee's ID, full name, time-in and time-out for both AM and PM sessions, and the date.

This eliminates the need to track attendance by hand, reducing the risk of errors and time discrepancies. The recorded data can also be quickly retrieved for purposes such as generating reports, evaluating performance, or processing payroll. Using QR codes improves the overall speed, accuracy, and transparency of attendance management, making it easier for the administrator to monitor employees' work schedules and punctuality.

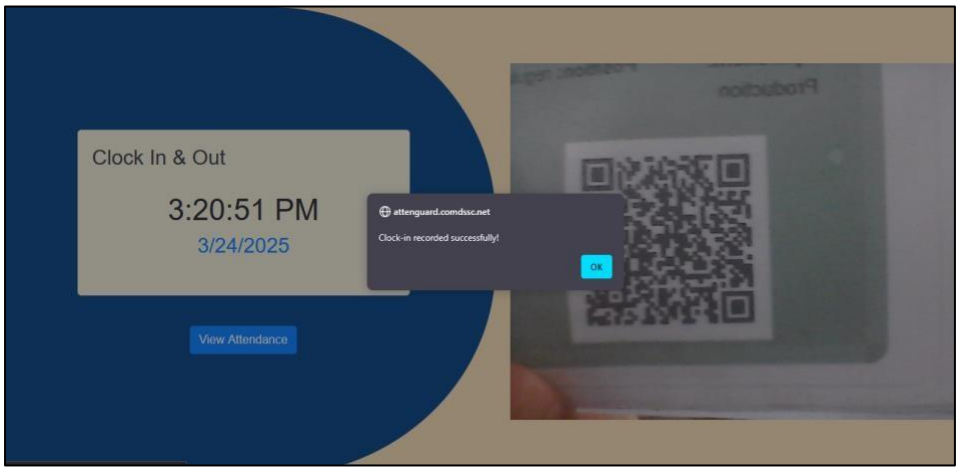


Figure 13. *GUI of QR Code Attendance Scanner*

Admin Account on Importing Biometric Attendance record

Figure 14 shows the Biometric Attendance Import Interface, which enables the administrator to import and manage biometric attendance information. The system extracts attendance data directly from biometric devices and presents it in a structured format for verification before database storage. The interface ensures the accurate transfer and secure storage of all imported records, including employee identifiers, timestamps, and attendance logs, within the system. Automating this process allows the administrator to efficiently aggregate historical attendance data, reducing manual labor and minimizing the risk of errors or data loss.

Moreover, incorporating biometric information into the database improves the reliability and integrity of attendance monitoring, providing a comprehensive and tamper-resistant record of employee attendance over several years. This function supports future reporting and analysis, enabling the firm to track attendance patterns and maintain accurate personnel records.

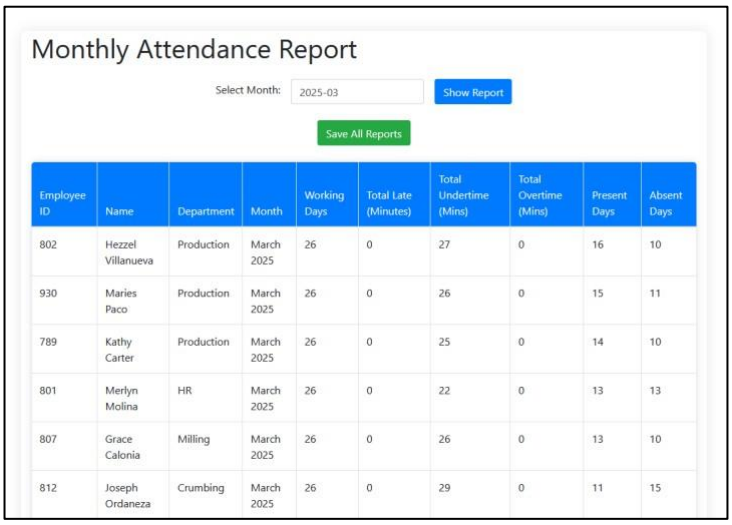


Figure 14. *GUI of Biometric Attendance Record*

Admin Account on Displaying Data Visualization

Figure 15 shows the Data Visualization Dashboard, a robust analytical tool that enables the administrator to create and analyze visual representations of essential employee-related data. The administrator can generate charts and graphs that show monthly attendance summaries by department, identify prevalent penalties earned by employees, and rank employees by attendance performance. These visualizations convert raw data into clear insights, enabling the administrator to quickly discern patterns, trends, and potential areas for improvement within the company.

The tool supports complex data analysis and enhances data-driven decision-making by presenting information in graphical formats, including bar charts, pie charts, and line graphs. Monthly attendance reports help assess departmental punctuality and attendance consistency, while penalty data highlight persistent behavioral difficulties that may require administrative intervention. Similarly, employee attendance rankings provide an objective basis for recognizing outstanding employees or addressing attendance-related issues. This tool improves management efficiency by delivering clear, precise, and actionable visual data that supports strategic planning and organizational improvement.

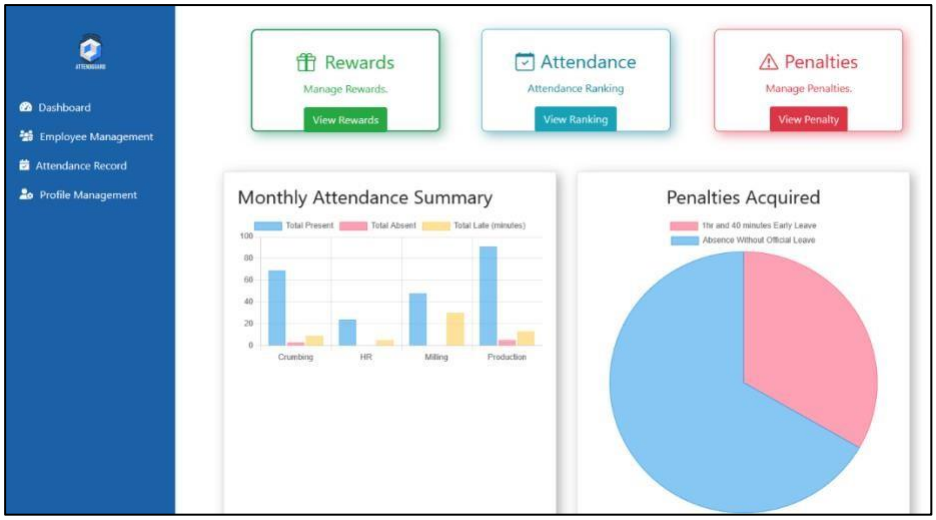


Figure 15. *GUI of the Admin data visualization*

User Account on Managing and Registering Account

The User Account Management Interface, shown in Figure 16, makes it easy for users to access and manage their personal accounts in the system. With this function, users can easily view personal information, such as name, employee ID, contact information, and other profile details stored in the database. The interface promotes transparency and user control by letting people verify that personal records are correct and that all information is current. This feature also enhances security by restricting access to authorized users only, preventing unauthorized changes to important data.

On the other hand, Figure 17 shows the User Registration Interface, which lets new users sign up and create an account in the system. Most of the time, this process requires entering important information like name, email address, position, and employee ID. This information is then verified and saved in the database. The registration interface is easy to use and quick, guiding users through the steps needed to set up accounts. The system makes it easier for new users to get started, reduces administrative labor, and ensures that all users have the right access credentials by allowing self-registration. These two aspects work together to make the system safe, well-organized, and user-friendly, which makes it easier to access and handle data.

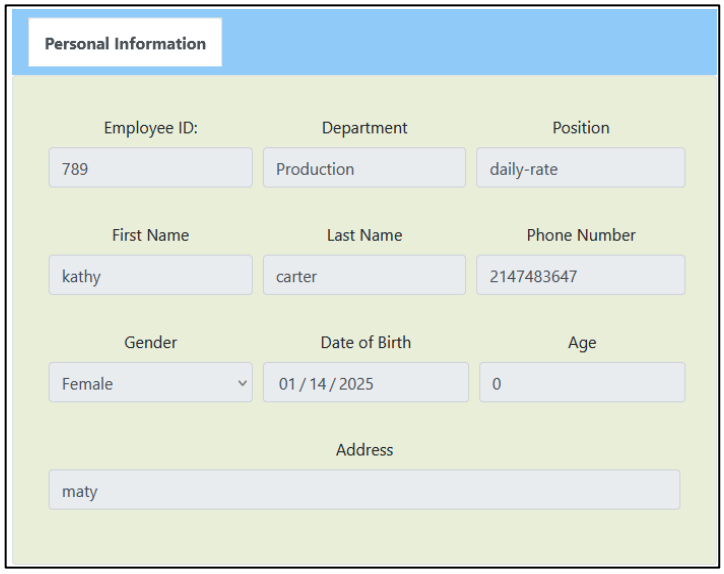


Figure 16. *GUI of the User Registration*

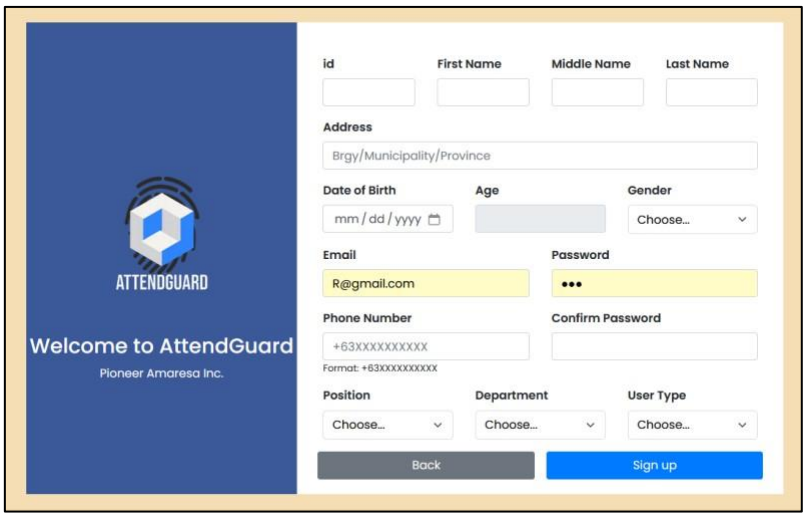
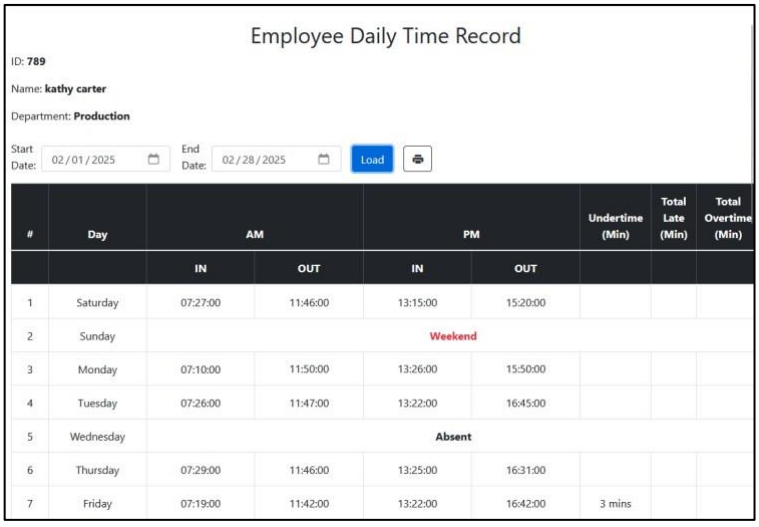


Figure 17. *GUI of the User Managing Account*

User Account on View DTR

Figure 18 shows the Daily Time Record (DTR) Monitoring Interface, which makes it easy for users to view and track their daily attendance and work hours in the system. With this tool, employees can maintain accurate time logs that show the exact minutes of lateness, overtime, and undertime for each day they work. The system automatically calculates these numbers based on when the person clocks in and out, making attendance tracking accurate and transparent.

This tool gives employees a clear picture of how on time they are and how well they are doing their jobs. It also lets them see patterns in their attendance and make changes to be more on time. The system also has a print option that lets users make hard copies of their daily time records to turn in, save for their own records, or use for other purposes. This tool is very helpful for reporting or checking things during payroll processing. The DTR Monitoring Interface makes the company more efficient and accountable by giving both employees and managers dependable, easy-to-find, and well-documented attendance statistics. This helps the organization keep track of time fairly and accurately.



Employee Daily Time Record

ID: **789**

Name: **kathy carter**

Department: **Production**

Start Date: 02/01/2025 End Date: 02/28/2025 Load

#	Day	AM		PM		Undertime (Min)	Total Late (Min)	Total Overtime (Min)
		IN	OUT	IN	OUT			
1	Saturday	07:27:00	11:46:00	13:15:00	15:20:00			
2	Sunday	Weekend						
3	Monday	07:10:00	11:50:00	13:26:00	15:50:00			
4	Tuesday	07:26:00	11:47:00	13:22:00	16:45:00			
5	Wednesday	Absent						
6	Thursday	07:29:00	11:46:00	13:25:00	16:31:00			
7	Friday	07:19:00	11:42:00	13:22:00	16:42:00	3 mins		

Figure 18. *GUI of the User's Daily time records*

User Account on viewing Penalty Status

Figure 19 shows the Daily Time Record (DTR) Monitoring Interface, which makes it easy for users to view and track their daily attendance and work hours in the system. With this tool, employees can maintain accurate time logs that show the exact minutes of lateness, overtime, and undertime for each day they work. The system automatically calculates these numbers based on when the person clocks in and out, making attendance tracking accurate and transparent. This tool gives employees a clear picture of how on time they are and how well they are doing their jobs. It also lets them see patterns in their attendance and make changes to be more on time.

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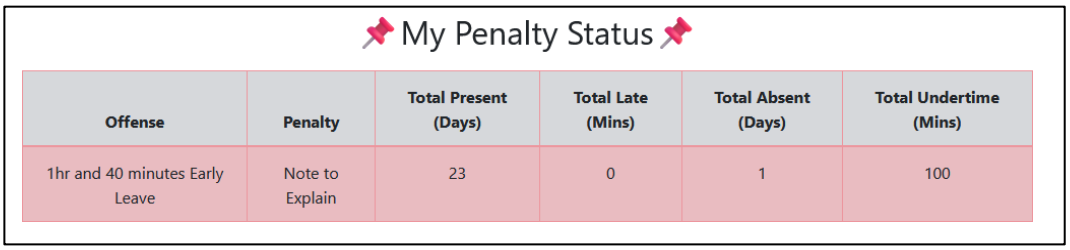

Figure 19. *User Module that displays Penalty Status*

User Account on viewing Rewards

The User Rewards Module Interface, shown in Figure 20, lets employees view and track the rewards they've earned in a given month. This feature gives employees a clear picture of their accomplishments and the rewards they receive based on attendance, presence, and overtime contributions to the team. The module displays key information, including the employee ID, name, total days worked, total overtime hours, and the specific rewards awarded.

By presenting this information in a structured, organized way, the system helps employees track their monthly achievements and see how their hard work is recognized. This transparency encourages workers to show up regularly, do their best work, and be more productive. The rewards module also fosters a positive work environment by showing that the company values and rewards hard effort. Administrators can also use the collected data to analyze performance trends and identify the best staff to praise or promote. Overall, this feature makes employees happier and helps the firm maintain a fair and merit-based reward system.

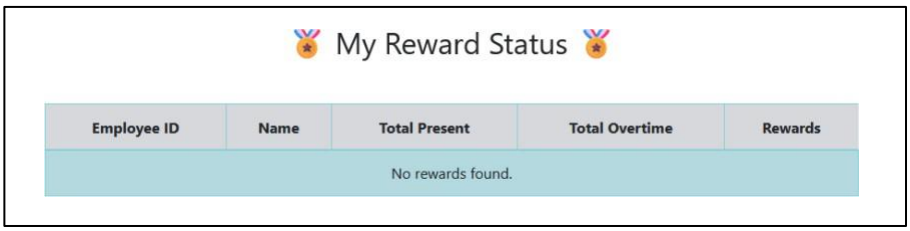

Figure 20. *GUI User Module that displays achieved rewards*

User Account on submitting Leave Application

Figure 21 shows the Leave Application Submission Interface, which allows users to submit their leave requests directly through the system. Employees must submit their applications at least five days before the deadline to give the administration sufficient time to review and approve them. The interface is easy to use, enabling employees to enter key details such as the type of leave, start and end dates, the purpose of the absence, and any supporting documents. This feature simplifies the leave request process by reducing paperwork and accelerating approvals. The Leave Application Tracking Interface in Figure 22 lets users monitor the status of their leave requests. This module allows employees to view their application history, check whether a request has been approved, denied, or is still pending, and access important details for each submission. Employees can also print approved applications as hard copies for record-keeping or administrative purposes.

Together, these modules make the leave management system more transparent and accountable. They empower employees to manage their leave efficiently, track progress in real time, and ensure that all leave transactions are properly documented and processed in accordance with organizational policies. This integrated approach streamlines the workflow, reduces administrative work, and promotes fair and prompt processing of leave requests.

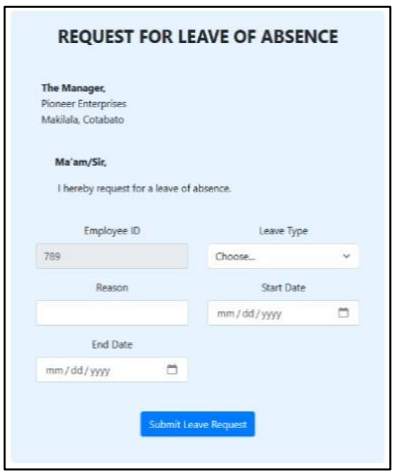

Figure 21. *GUI of employee's leave application*

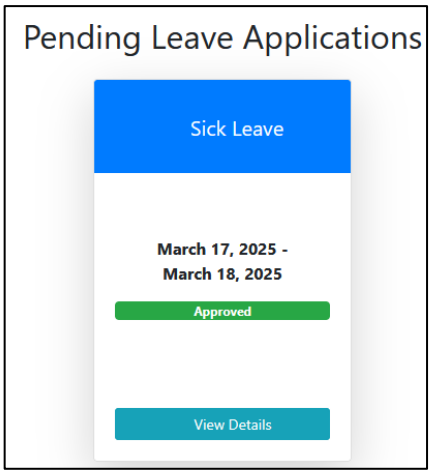

Figure 22. *GUI of employee's leave application status*

Evaluation Ratings from the Respondents in terms of Functionality

According to the information in Table 3, most respondents to the survey were satisfied with the system's User Module in terms of how well it worked. The module's ability to create and manage user accounts, monitor daily time records, and handle leave requests received an average score of 4.49, which corresponds to "Agree." This indicates that users trust these functions to support everyday tasks. Notably, the feature that notifies users of their penalty status received the highest grade (a mean of 4.69, which corresponds to "Strongly Agree"). This suggests that users strongly appreciate the system's prompt notification feature, which increases awareness and accountability. Overall, the consolidated mean of 4.50, which corresponds to "Agree," indicates that the User Module works well and meets workers' operational needs. This aligns with earlier research that emphasized the importance of system usefulness and responsiveness for user satisfaction and the efficiency of digital workplace management systems (Davis, 1989; Al-Fraihat *et al*., 2020).

Table 3. *Evaluation rating from the respondents in terms of Functionality for User (February 2025)*

Particulars	Mean	Verbal Interpretation
The user module of the system can efficiently register and manages accounts		Agree
The user module of the system can effectively monitor Daily time records	4.49	Agree
The user module of the system can accurately manage leave requests without problems.	4.49	Agree
The user module of the system can effectively receive notification about the penalty status.	4.69	Strongly Agree
Consolidated Mean	**4.50**	**Agree**

Table 4. *Evaluation rating from the respondents in terms of Functionality for Admin (February 2025)*

Particulars	Mean	Verbal Interpretation
The system with the admin account can efficiently register new accounts.	4.5	Agree
The system with the admin account can accurately monitor the employee data	4.34	Agree
The system with the admin account can efficiently confirm employee leave applications.	3.83	Agree
The system with the admin account can accurately captures attendance using QR Code Scanner.	4.33	Agree
The system with the admin account can efficiently imports attendance data from biometric scanner.	4.17	Agree
The system with the admin account can effectively notifies employee about penalty status.	4.34	Agree
The system with the admin account is accurate on generating data visualizations for monthly reports of attendance by department	5.00	Strongly Agree
Consolidated Mean	**4.36**	**Agree**

Table 4 presents respondents' evaluations of the eHRMAM system's functionality for the admin account. Results indicate that administrators generally found the system highly effective at core HR tasks. Specifically, the system received its highest score for generating data visualizations for monthly attendance reports (5.00 – Strongly Agree), underscoring the reporting module's usefulness for monitoring departmental attendance trends. Other functional aspects, including registering new accounts (4.5), monitoring employee data (4.34), capturing attendance via QR code (4.33), importing biometric attendance data (4.17), confirming leave applications (3.83), and notifying employees of penalty status (4.34), also received positive ratings, with all items interpreted as "Agree." The consolidated mean of 4.36 reflects overall satisfaction with the system's functionality from an administrative perspective, suggesting that it meets its intended purpose of streamlining HR operations and improving accuracy in attendance monitoring.

These findings align with prior research indicating that well-designed HR information systems enhance administrative efficiency and accuracy in HR processes, particularly when integrating automated attendance tracking and reporting tools (Alenezi *et al*., 2020). The slightly lower score for leave application confirmation (3.83) may suggest a need for minor interface or workflow refinements to further improve usability for administrative tasks. Overall, the data support the system's capability to provide reliable, efficient, and user-friendly functionality for HR administrators.

The ISO 25010 Software Quality Framework was used to evaluate the system based on functionality, performance efficiency, reliability, and usability (ISO/IEC, 2011). This approach made the assessment systematic and comprehensive, identifying strengths and weaknesses in system design and implementation.

Table 5. *Summary of User Rating based on ISO 25010 Software Quality Framework*

Quality Characteristics	Mean	Descriptive Equivalence
Functionality	4.43	Agree
Performance Efficiency	4.30	Agree
Usability	3.96	Agree
Reliability	3.96	Agree
Total	**4.16**	**Agree**

Summary of User Rating based on ISO 25010 Software Quality Framework

Table 5 summarizes user ratings of the system using the ISO 25010 Software Quality Framework, which assesses software quality across functionality, performance efficiency, usability, and dependability. The system received a mean rating of 4.16 (Agree), indicating that it meets quality criteria. Functionality scored the highest at 4.43, reflecting that the system effectively tracks attendance, leave, and penalties. Performance efficiency was 4.30, indicating that the system operates quickly and efficiently. Lower scores of 3.96 for usability and reliability suggest areas for development. The interface design could be improved to enhance intuitiveness and user experience, while minor data retrieval errors in the attendance report module raise reliability concerns. ISO 25010 calls for ongoing improvement in several areas to maintain software quality and user satisfaction (ISO/IEC,

2011). The review shows that while the system is functionally robust and efficient, targeted improvements in usability and reliability would boost its efficacy and adoption.

Conclusion

The eHRMAM effectively met its objectives of automating attendance tracking and enhancing administrative efficiency through secure, multi-factor authentication. By integrating biometric and QR code verification, the system improved the accuracy of attendance records and reinforced accountability, transparency, and reliability in the workplace. The successful implementation of these features shows that the system can minimize human error, prevent proxy attendance, and support fair disciplinary monitoring.

Positive evaluation outcomes, measured using the ISO 25010:2011 Software Quality Model, confirm the system's usability, functionality, performance efficiency, and reliability, highlighting its readiness for practical deployment in real-world organizational contexts. Feedback from employees, HR personnel, and panel evaluators indicates that the system facilitates self-service access to attendance and leave records, simplifies leave management, and streamlines the calculation of penalties and rewards, thereby reducing administrative workload and improving overall HR operations.

Overall, this project demonstrates that transitioning from manual, logbook-based attendance procedures to a digital, web-based HR system can substantially enhance human resource management. Beyond operational efficiency, the system supports data-driven decision-making, organizational accountability, and employee engagement, aligning with modern HR best practices. Furthermore, eHRMAM provides a foundation for future enhancements, including advanced analytics for performance monitoring, mobile accessibility, integration with payroll systems, and expansion to accommodate larger or multi-branch organizations. These potential developments can further strengthen HR operations, support organizational productivity, and serve as a model for similar institutions seeking to modernize their human resource practices.

Recommendation

Based on the System's findings and evaluation results, several recommendations are proposed to enhance its functionality, scalability, and practical applicability. Future improvements may include a mobile application that allows employees and administrators to access attendance records, submit leave requests, and receive real-time notifications, improving convenience and accessibility for off-site or remote staff.

Integrating the System with payroll, performance evaluation, and employee scheduling modules is also recommended to further streamline HR operations and automate processes such as salary computation and incentive tracking. Migrating the database to a cloud-based environment would enhance data security, accessibility, and disaster recovery, while adding advanced analytics and interactive dashboards could provide management with deeper insights into attendance patterns, productivity trends, and employee behavior, supporting data-driven decision-making.

To ensure the System's long-term effectiveness, continuous maintenance and user training should be conducted to minimize errors and promote proper use of the platform. Finally, broader implementation of the System is encouraged for other organizations transitioning from manual to digital HR processes, as its modular design allows customization to accommodate different organizational structures and policies.

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