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Implementation Of Agile Methods In Designing A Web-Based Information System In The Geomin Laboratory Of PT Antam Tbk

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***Abstract*— The management of human resource administration at the Geomin Laboratory Unit of PT Antam Tbk, which includes recording attendance, overtime requests, and leave requests, faces various obstacles due to the continued implementation of manual procedures. This process, which relies on physical forms, is not only time-consuming in recapitulation, but is also prone to recording errors and document loss, as well as the lack of accurate quota monitoring. This study aims to design and build a web-based information system that can overcome these problems by integrating all administrative processes into a single digital platform. The development method used in this study is the Agile method, which allows for a flexible and iterative development process. This system is built using the Laravel framework and utilizes geolocation technology for attendance validation. The result of this study is a functional information system with key features such as online attendance, a multi-level approval flow, and real-time leave quota management. Based on the results of the User Acceptance Test involving 15 respondents from various roles, this system achieved an acceptance rate of 93.1%, which falls into the "Highly Acceptable" category. This shows that the developed system has successfully answered user needs and can be an effective solution to increase the efficiency and accuracy of administrative processes in the laboratory environment.**

***Index Terms*— agile; attendance; human resources; information systems; laravel.**

I. INTRODUCTION

Efficient and accurate human resource (HR) administration is a crucial element in maintaining smooth operations in every company's work unit [1]. PT Antam Tbk's Geomin Unit Laboratory, for administrative activities such as attendance recording, overtime requests, and leave management, requires a thorough and precise system, as the accuracy of these processes impacts employee discipline and productivity. Based on the author's experience as an administrative staff member at the laboratory, it was discovered that attendance, overtime, and leave management are still performed manually using physical forms. This manual system creates various obstacles, such as delays in data recapitulation, the risk of recording errors, lost documents, and unclear monitoring of leave quotas.

According to Prasetyo and Komarudin [2], the manual system makes the absence and leave application process inefficient due to obstacles such as difficulty obtaining superior approval, lost or damaged forms, and the lack of document backups. Meanwhile, Mahardi and Wicaksono [3] emphasized that the lack of an integrated system can lead to data duplication and increase the workload of the HR department. Therefore, developing a web-based information system is a strategic step to address these issues. This system is expected to provide centralized data access, expedite the application and approval process, and automate leave quota calculations with automatic validation features and digital recording, improving administrative efficiency and accuracy.

This aligns with the opinion of Lubis and Adlina [4] that the use of a Human Resource Information System (HRIS) can make managing personnel, payroll, and attendance data more effective and efficient. In its development, an Agile approach was used, which is flexible and iterative, allowing for dynamic system adjustments to user needs and emphasizing active collaboration between developers and users. Farras et al. [5] also demonstrated that implementing Agile methods can increase efficiency and productivity in HR management.

Effective human resource administration requires the support of a Human Resource Information System (HRIS). According to Sipahutar and Widyaningsih [1] , an HRIS is a combination of human resource management and information technology, while Lubis and Adlina [4] state that an HRIS serves to manage personnel information in an integrated manner, thereby increasing effectiveness and efficiency compared to manual systems. Thus, HRIS can help organizations manage personnel data more quickly, accurately, and in a structured manner.

While commercial HRIS technologies already exist, developing a customized Web-Based Information System specifically for the Geomin Unit Laboratory of

PT Antam Tbk is highly necessary. Commercial systems often involve recurring licensing costs and rigid workflows. In contrast, a customized system is free from third-party licensing, easy to manage, simple to modify, and seamlessly upgradeable to accommodate the laboratory's specific multi-level approval hierarchy.

The Agile method was used in developing this system because it can adapt to changes in user needs. Prastowo et al. [6] note that Agile focuses on user satisfaction through continuous software development. Meanwhile, Handayani et al. [7] explain that Agile emphasizes rapid response to changes through the stages of planning, implementation, testing, deployment, and maintenance. Therefore, this method was chosen because it supports flexible system development tailored to user needs.

The attendance system utilizes the Haversine algorithm to validate employees' attendance locations. According to Wijaya and Tony [8] this algorithm is used to calculate the distance between two geographic coordinate points so that the system can determine whether a user is within a specified radius. The use of the Haversine algorithm has been shown to improve the accuracy of attendance validation and support the implementation of geolocation-based attendance tracking [9].

Previous research has shown that information technology can improve the effectiveness of personnel administration. Wijaya and Tony [8] as well as Hazani and Mursid [10] demonstrated that the application of the Haversine algorithm in a web-based attendance system can validate attendance locations and improve attendance accuracy. Winanto et al. [11] developed a web-based leave request system that was deemed feasible and effective in streamlining administrative processes. Meanwhile, Junaedi et al. [12] demonstrated that the Laravel framework is suitable for HRIS system development due to its modular nature and ease of development. Additionally, Farras et al. [5] concluded that the Agile Scrum method can produce flexible systems that align with user needs.

Based on this background, this research focuses on the application of Agile methods in designing a web-based information system at the Geomin Unit Laboratory of PT Antam Tbk as a solution to existing administrative problems, with advantages in processing speed, data accuracy, ease of access, and reducing the risk of document loss due to manual systems.

The purpose of this research is to design and develop a web-based information system that can centrally and efficiently manage attendance, overtime, and leave data. Furthermore, this research aims to apply an Agile approach to the information system development process to ensure the system's flexibility and ability to adapt to user needs throughout the development process. It also aims to introduce digital features such as online attendance recording with validation, a tiered approval process, automatic recapitulation, and integrated leave quota monitoring, all of which can improve the effectiveness and efficiency of HR administration at the Geomin Unit Laboratory of PT Antam Tbk.

II. METHOD

A. Software Requirements Analysis

Based on the author's observations, personnel administration processes at the Geomin Unit Laboratory, such as attendance, overtime, and leave, are still carried out manually using physical forms. This system involves four main actors: Personnel, who record attendance and request leave or overtime; Assistant Managers, who provide initial approval; Managers, who provide final approval; and Admins, who manage master data, leave quotas, and reports. All four play an integrated role to create effective and transparent administrative management.

B. System Architecture

The system architecture in this study uses the Model-View-Controller (MVC) pattern, which is the basis of the Laravel framework. This pattern separates data, user interface, and control logic, making the system more structured, modular, and easy to develop. The Model manages data and business rules through the Eloquent class in app/Models, the View displays data using the Blade templating engine, and the Controller acts as a bridge between the two by processing user input and displaying results to the View through classes in app/Http/Controllers.

C. Database Design

After designing the system architecture, the next stage is database design, which defines the data storage structure as the main foundation of system functionality. The goal of this stage is to build a structured, efficient data model that maintains long-term data consistency and integrity. The design process involves three main stages: conceptual modeling using Entity Relationship Diagrams (ERDs), logical structure design using Logical Record Structures (LRSs), and defining technical specifications for each table used in the system.

D. Interface Design

Interface design aims to organize all visual aspects of an information system, including layout, color scheme, and typography. The primary goal is to create a functional, intuitive, and user-friendly interface to provide an optimal user experience.

In terms of color scheme and typography, the system uses a primary color palette of blue (#435ebe) for interactive elements such as buttons and links. This color is combined with green (#198754) for success notifications, red (#dc3545) for warning or error messages, and light blue (#f2f7ff) for the background to

create a clean and spacious feel. The primary text color is a bluish gray (#607080) for easy readability.

TABLE I. SYSTEM COLOR SCHEME

Name	Hex Code	Preview
Primary Color (Blue)	#435ebe	
Background Color	#f2f7ff	
Primary Text Color	#607080	
Success Accent (Green)	#198754	
Warning/Error Accent (Red)	#dc3545	

The chosen font is Nunito, a modern and user-friendly sans-serif font, ensuring text remains clear and comfortable to read on various screen sizes.

E. Agile Development

This research employs the Agile methodology, which prioritizes customer satisfaction through continuous and early software delivery [6]. The Agile approach allows for rapid adaptation to changing requirements through short development cycles and intensive collaboration between developers and users [7]. The process typically involves structured phases: planning, implementation, testing, documentation, deployment, and maintenance [7].

To apply Agile principles concretely, the initial requirements gathered from the Geomin Laboratory of PT Antam Tbk were first translated into user stories. Examples of these user stories include: "As a personnel member, I want to submit leave requests online so that my quota is automatically updated," and "As a manager, I need to bulk-approve overtime requests to streamline the administrative process." These user stories were then evaluated, prioritized, and compiled into a Product Backlog.

The system development spanned approximately one month (mid-April to mid-May 2025). Before each cycle, a sprint planning phase was conducted to pull specific user stories from the Product Backlog into the Sprint Backlog. The project was divided into four distinct iteration cycles (sprints), with each sprint focusing on delivering specific, functional modules:

- Sprint 1 (Master Data and Core Setup): This initial phase focused on system initialization, including Laravel setup, database migration, and the development of the authentication module (login/register). It also covered the Master Data management module, enabling Admins to manage personnel profiles, roles (e.g. Assistant Manager Analis, Assistant Manager Preparator), holiday schedules, and vendor information.
- Sprint 2 (Business Travel and Leave Management): The second iteration shifted focus to employee administration features. It began with the Business Travel (Perjalanan Dinas) module, followed by the complete Leave (Cuti) management system. This included leave quota generation, submission forms, PDF template generation, and the implementation of role-based access control and approval workflows.
- Sprint 3 (Overtime and Notifications): This sprint was dedicated to the Overtime (Lembur) module. Development included overtime request views, recap functionality, PDF template generation, and an automated email notification system for overdue reminders, bulk overtime approvals, and individual status updates.
- Sprint 4 (Attendance and Finalization): The final sprint implemented the most complex feature: the geolocation-based daily attendance system (check-in/check-out). This phase also included the attendance correction workflow, monthly timesheet management (with filtering and PDF export), and final code refactoring to improve system maintainability before deployment.

At the end of each sprint, the developed modules were evaluated against the initial requirements. This concrete application of short, focused sprints allowed for continuous integration and immediate adjustments, ensuring the final Web-Based Information System was robust, functional, and ready for the User Acceptance Test (UAT).

III. RESULT AND DISCUSSIONS

A. Implementation of Main Functions

The daily attendance feature is the primary function most frequently used by personnel. The flowchart in Fig. 1 shows the process from logging in, selecting the attendance menu, to recording attendance by the system, ensuring the attendance process is automated, accurate, and efficient.

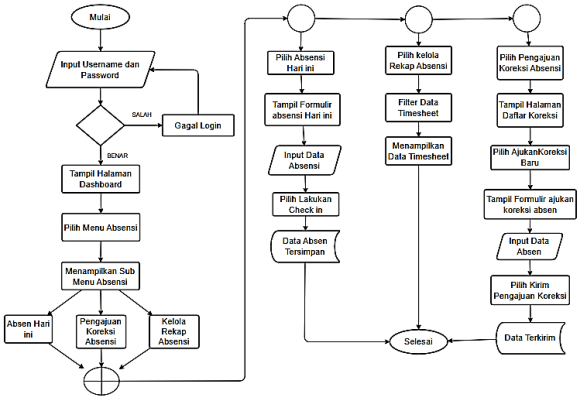

Fig. 1. Daily Attendance Process Flowchart (Personnel)

The leave approval feature illustrates a multi-level approval process involving management. Fig. 2 shows the workflow of the Assistant Manager as the first

approver, who is responsible for conducting initial validation of leave requests from personnel before they are forwarded to the next approval stage.

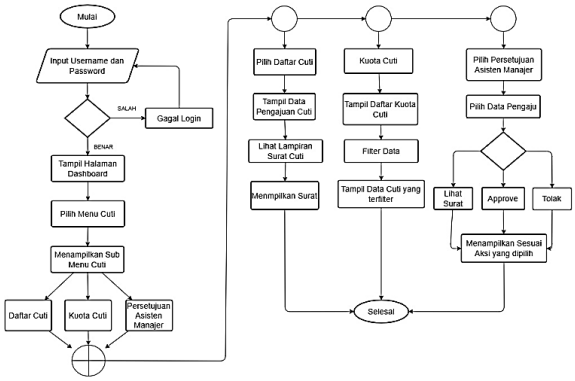

Fig. 2. Leave Approval Process Flowchart (Assistant Manager)

Once approved by the Assistant Manager, the process proceeds to the final stage by the Manager. Fig. 3 shows how the Manager reviews the validated application and makes a final decision on the leave request.

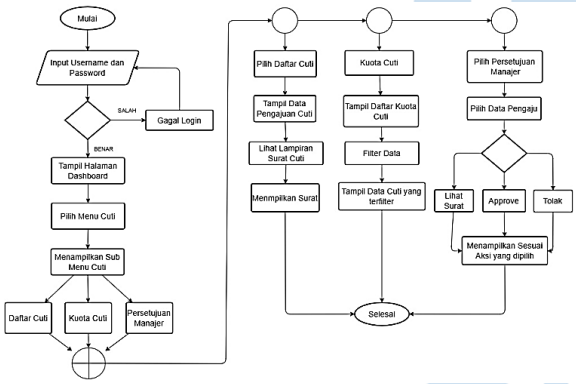

Fig. 3. Flowchart of Leave Approval Process (Manager)

As the primary function in master data management, Fig. 4 displays the Admin workflow in the Manage Personnel menu. This process includes menu selection and the options to add, change, and delete user data, which also illustrates a similar flow in the Manage Vendor and Manage Holiday features.

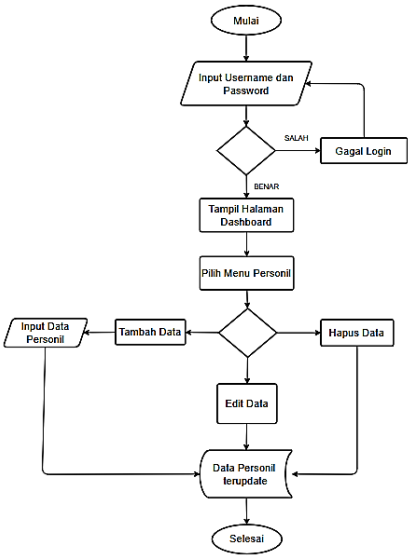

Fig. 4. Personnel Data Management Process Flowchart (Admin)

B. Test Result

The primary focus of this testing is on the accuracy of the input and output processes in each feature. To ensure structured testing, test scenarios are divided based on user roles (actors). The first section, General Functionality Testing (Authentication), is presented in Table II, which contains various test scenarios for the login and authentication features applicable to all user types.

TABLE II. BLACK BOX TEST (AUTHENTICATION)

Testing Scenario	Expected results	Results	Conclusion
The user entered a valid email address and password.	The system successfully authenticates and redirects the user to the appropriate dashboard page.	Appropriate	**Valid**
The user entered an incorrect password.	The system rejects the authentication and displays the error message "Email or password is incorrect."	Appropriate	**Valid**
The user logged out.	The system successfully terminates the session and redirects the user to the login page.	Appropriate	**Valid**

Table III details comprehensive test scenarios for features accessible to users with the Admin role.

TABLE III. BLACK BOX TEST (ADMIN)

Modul	Testing Scenario	Expected results	Results	Conclusion
Manage Personnel	Add, modify, and delete personnel data (CRUD).	All CRUD operations on personnel data performed as expected.	Appropriate	**Valid**
Manage Vendors	Add, modify, and delete vendor data (CRUD).	All CRUD operations on vendor data performed as expected.	Appropriate	**Valid**
Manage Holidays	Add, modify, and delete vacation data (CRUD).	All CRUD operations on holiday data performed as expected.	Appropriate	**Valid**
Overtime Requests	Request overtime on behalf of another employee.	The application was successfully saved and recorded under the name of the selected employee.	Appropriate	**Valid**
Leave Requests	Request leave for yourself.	The application was successfully saved and entered the approval flow.	Appropriate	**Valid**
Leave Quotas	Edit an employee's remaining leave quota.	The employee leave quota data was successfully updated in the database.	Appropriate	**Valid**
Attendance Summary	View and filter attendance summaries for all employees.	The page displays the attendance summary data correctly.	Appropriate	**Valid**
Attendance Summary	Download approved monthly timesheets.	The system successfully downloaded a valid PDF file.	Appropriate	**Valid**
Overtime Summary	Export overtime summary data to Excel.	The system successfully downloaded an Excel file containing the appropriate data.	Appropriate	**Valid**
Export Overtime Forms	Download PDF forms for approved overtime requests.	The system successfully downloaded the PDF file correctly.	Appropriate	**Valid**
Export Leave Forms	Download PDF forms for approved leave requests.	The system successfully downloaded the PDF file correctly.	Appropriate	**Valid**

Table IV details the test scenarios for the features accessible to users with the Personnel role.

TABLE IV. BLACK BOX TEST (PERSONNEL)

Modul	Testing Scenario	Expected results	Results	Conclusion
Attendance	Check in and check out on the same day.	Attendance data is recorded correctly, including arrival and departure times.	Appropriate	**Valid**
Attendance Correction	Submit corrections for incomplete attendance data.	The correction request is successfully submitted with the status "Awaiting Approval."	Appropriate	**Valid**
Overtime	Submit a new overtime request (Create).	The request is successfully saved and appears in the request history.	Appropriate	**Valid**
Overtime	Edit an overtime request that is still "Pending Approval" (Update).	The data changes to the request are successfully saved.	Appropriate	**Valid**
Overtime	Cancel an overtime request (Cancel).	The request status changes to "Cancelled."	Appropriate	**Valid**
Leave	Submit a leave request with valid dates and sufficient quota (Create).	The request is successfully saved.	Appropriate	**Valid**
Leave	Edit a leave request that is "Rejected" (Update).	The edit form opens, and a new request can be submitted.	Appropriate	**Valid**
Leave	Download an approved leave form.	The system successfully downloads the appropriate PDF file.	Appropriate	**Valid**
Business Travel	Submit a 30-day business trip request.	After the business trip is completed, the special leave quota is automatically increased by 3 days.	Appropriate	**Valid**
Profile	Change a password by confirming an invalid password (Invalid).	The system displays the error message "Password confirmation does not match."	Appropriate	**Valid**

Table V details the test scenarios for the features accessible by the Management role.

TABLE V. BLACK BOX TEST (MANAGEMENT)

Modul	Testing Scenario	Expected results	Results	Conclusion
Leave Approval	Reject leave requests by providing a reason for the rejection.	The application status changes to "Rejected," and a notification with a reason is sent to the personnel.	Appropriate	**Valid**
Overtime Approval	Approve multiple overtime requests at once (bulk approve).	The status of all selected applications changes to "Approved" (or the next level).	Appropriate	**Valid**
Timesheet Summary	Make final approvals on monthly timesheet recaps.	The timesheet status changes to "Approved," and can be printed as a PDF.	Appropriate	**Valid**
Absence Correction	Approve requests for absence corrections.	The associated attendance data is successfully updated based on the application.	Appropriate	**Valid**
Authorization	Attempt to access the Manage Personnel menu (direct URL).	The system denies access, displays an error notification, and redirects you to the dashboard.	Appropriate	**Valid**

After the system has passed the functional test, the next stage is the User Acceptance Test (UAT), which aims to assess the level of user acceptance and satisfaction with the system. Unlike black box testing, which focuses on functionality, UAT assesses usability, ease of use, and the system's suitability to operational needs in a real-world work environment. The UAT was conducted through a survey using a questionnaire containing closed-ended questions regarding the system's usability, appearance, and usefulness. Respondents provided ratings using a Likert scale of 1–5, with the following interpretations: 5 = Strongly Agree, 4 = Agree, 3 = Somewhat Agree, 2 = Somewhat Disagree, and 1 = Disagree.

A total of 15 respondents from the Geomin Unit Laboratory of PT Antam Tbk were involved, consisting of 2 Admins, 3 Management, and 10 Personnel, representing all user roles in the system.

To ensure the accuracy of the evaluation, the study employed a contextual validation approach rather than traditional variance-based reliability tests. Due to the role-specific nature of the HRIS modules (Role-Based Access Control), the questionnaire was not uniform; rather, it was divided into distinct sections tailored specifically for Admin, Management, and Personnel tasks. Because respondents did not answer identical sets of questions, tests such as Cronbach's Alpha were statistically inapplicable. Instead, validity was ensured by aligning each questionnaire item directly with the specific operational flow of the respective user role, ensuring the instrument accurately measured user acceptance based on their distinct administrative functions.

After all the questionnaire data were collected, the authors conducted a quantitative analysis to assess the level of user acceptance of the system. This analysis was performed by calculating the ideal score percentage, which was obtained using the following formula:

$$Percentage = \frac{Total\ score\ obtained}{Maximum\ total\ score}\ x\ 100\% \quad (1)$$

The percentage results are then interpreted based on the following ranges:

TABLE VI. UAT INTERPRETATION SCALE

Percentage Range	Interpretation
81% - 100%	Highly Acceptable
61% - 80%	Good / Acceptable
41% - 60%	Fair
21% - 40%	Poor
0% - 20%	Unacceptable

Based on the quantitative analysis of all UAT questionnaires, a user acceptance rate of 93.1% was obtained, which falls into the “Highly Acceptable” category according to the interpretation range of 81%–100%. This result indicates that the developed information system has been excellent received by users and is able to meet the needs and resolve operational problems at the Geomin Unit Laboratory of PT Antam Tbk. Details of the results are presented in the following table.

TABLE VII. FINAL RECAPITULATION OF UAT RESULTS

Group	Score Obtained	Maximum Score	Percentage	Interpretation
Admin	49	50	98.0%	Highly Acceptable
Management	71	75	94.7%	Highly Acceptable
Personnel	229	250	91.6%	Highly Acceptable
Total	**349**	**375**	**93.1%**	**Highly Acceptable**

C. Discussion

The developed system successfully digitized the attendance, leave, and overtime administration processes that were previously performed manually. Under the previous system, employees were required to complete paper-based forms and wait for physical approval from supervisors, which often caused delays, document loss, and difficulties in monitoring

administrative records. By implementing a web-based HRIS, all data can be stored and managed centrally, improving accessibility, efficiency, and accuracy in personnel administration. These findings are consistent with previous studies which state that HRIS implementation can improve the effectiveness of human resource management and reduce dependence on manual processes [3].

The attendance feature integrated with geolocation technology and the Haversine algorithm provides an additional advantage compared to conventional attendance systems. The system automatically validates whether employees are within the permitted attendance radius before attendance data is recorded. This mechanism minimizes attendance fraud and improves the accuracy of attendance records. Similar results were reported in previous studies evaluating location-based attendance monitoring [13], [14].

From an operational perspective, the implementation of a multi-level approval workflow enables leave and overtime requests to be processed more efficiently. Employees can submit requests online, while Assistant Managers and Managers can review and approve requests in real time. Compared to the previous manual process—which typically took 1.5 to 3 working days for a complete approval cycle—this digital approach reduces the processing time to mere minutes, eliminating administrative delays and improving transparency. Similar benefits of web-based administrative systems have been identified in recent literature; digitalization has been proven to significantly simplify personnel administration [2], and geolocation-based systems enhance employee discipline [14].

The use of the Laravel framework also contributed to the successful implementation of the system. Laravel provides a structured MVC architecture that facilitates system maintenance, scalability, and future development. Previous studies [12] similarly concluded that Laravel is suitable for developing complex web-based information systems because of its modular structure and development efficiency.

During implementation, several challenges were encountered, particularly in adapting users who were accustomed to manual administrative procedures. Some users required additional guidance during the initial adoption phase. However, the Agile development approach enabled continuous feedback collection and iterative improvements throughout the development cycle. This finding supports previous research [15], which demonstrated that Agile methodologies facilitate adaptation to changing requirements and improve system suitability to user needs.

The User Acceptance Test (UAT) produced an acceptance score of 93.1%, indicating that the system was highly accepted by users. This result reflects not only the functionality of the developed features but also the system's ability to address operational challenges within the Geomin Laboratory. Similar high levels of user acceptance and service improvement have been reported in web-based information system implementations [16]. Furthermore, the use of a Likert-scale-based evaluation approach is consistent with recommendations in [17] for measuring user satisfaction and service quality in information systems.

Although the system achieved a high user acceptance rate, this study has several limitations. The UAT was conducted with only 15 respondents from a single organizational unit, which may limit the generalizability of the results. In addition, the use of questionnaire-based assessments may introduce response bias because user perceptions are inherently subjective. To address these limitations, future studies are encouraged to involve larger and more diverse samples to evaluate the long-term impact on organizational performance. Furthermore, subsequent system development should focus on integrating automated payroll modules, incorporating disaster recovery and data backup systems, and implementing biometric authentication to further strengthen attendance validation.

IV. CONCLUSIONS

A web-based personnel information system at the Geomin Unit Laboratory of PT Antam Tbk has been successfully developed to replace manual processes with a more efficient, accurate, and secure digital one. The application of Agile methods allows the system to be developed adaptively to user needs. Based on the results of the User Acceptance Test (UAT), with an acceptance rate of 93.1%, the system is considered highly acceptable and beneficial to all users.

It is recommended that the system be developed into a mobile app (Android/IOS) to improve accessibility, and that a more structured Agile framework such as Scrum be used. Furthermore, further development can be directed at integrating modules compliant with the ISO/IEC 17025 standard, such as competency management and personnel training.

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