Development of a Web Based Internship Management System Using Agile at Sultan Thaha Airport

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Abstract - This study discusses the development of a web-based Internship Management Information System at PT. Angkasa Pura II Sultan Thaha Saifuddin Airport Jambi using the Agile Lean Software Development (LSD) method. The system was developed to address issues in internship program management, such as the lack of a structured data recording system, difficulties in monitoring participants' attendance, undocumented performance evaluations, and the absence of a proper storage system for interns' projects. The research began with a needs analysis conducted through observations and interviews with relevant stakeholders. The system was developed in seven sprints, with each sprint delivering key features incrementally. User Acceptance Testing (UAT) was conducted by involving employees to evaluate system acceptance. The results showed a 78% acceptance rate, categorized as "Good." The developed system includes key features such as intern data management, participant schedules, daily logbooks, internship reports, and digital certificate issuance. Additionally, the system serves as a long-term documentation platform that can be utilized for further research or as a reference for airport-related projects. By applying Agile LSD, the system development proved to be flexible and adaptive to user needs. This method also emphasizes the importance of communication between developers and stakeholders, ensuring that the system meets industry requirements. Moreover, Agile LSD is highly suitable for small development teams due to its flexibility in supporting rapid and efficient development.

*Keywords***:** *Agile Lean Software Development; Internship Management System; Web-Based System.*

1. INTRODUCTION

Internships provide students with opportunities to develop professional skills, gain insights into the working environment, and bridge theoretical knowledge with real-world applications. In the industrial sector, managing internship programs is important not only for providing students with work experience but also for identifying potential recruits who align with company values [1]. As part of the airport service industry, PT. Angkasa Pura II Sultan Thaha Saifuddin Airport Jambi organizes internship programs to offer students hands on experience. However, the company faces several challenges in managing these programs. Issues include the lack of a structured data recording system, difficulties in monitoring interns' attendance, untracked performance evaluations, and the absence of a centralized repository for interns' projects. These challenges could impact the credibility of PT. Angkasa Pura II in managing its internship programs. Based on observations, in a three-month internship period, approximately five interns are placed in each unit, and there typically four units that accept interns. This mean there are around 20 interns in each period, and over the course of the year, the number reaches approximately 80 interns. This relatively high number increases the risk of the aforementioned issues if not supported by a structured and integrated system.

To address these issues, this study proposes the development of a web-based Internship Management Information System. Prior research has shown that such a system can help improve internship program management and user [2][3]. A study at Odama Studio demonstrated that an internship management system, evaluated using the System Usability Scale (SUS), achieved an average score of 79.58, indicating high user acceptance.

For system development, several methodologies exist, including Waterfall, Prototype, and Agile [4]. Agile, particularly with the Lean Software Development (LSD) approach, is the most suitable for this project due to its iterative nature, user collaboration, adaptability, and flexibility. Previous research on Agile Project Management in internship systems has demonstrated that this method allows developers and users to

manage the system with more ease [5][6][7]. This study focuses on designing and developing an internship management system for PT. Angkasa Pura II Sultan Thaha Saifuddin Airport Jambi. The implementation of this system is expected to support the company in managing its internship program and addressing existing challenges.

2. RESEARCH METHODOLOGY

This study employs the Agile Lean Software Development method to develop a web-based internship management information system. Agile was chosen over traditional models such as Waterfall due to its flexibility in accommodating changing requirements and frequent user feedback throughout the development process. Unlike the linear nature of the Waterfall model, Agile allows for continuous iteration and user involvement, which is crucial for ensuring that the system meets real-time operational needs in the field. Lean Software Development focuses on maximizing user value by eliminating unnecessary activities, while Agile provides an iterative framework for continuous improvements. This study follows the Build Measure Learn cycle to ensure the system aligns with user needs [8].

a. Build, this stage begins with gathering user requirements through interviews and observations. Based on the collected data, an initial prototype or Minimum Viable Product (MVP) is developed to validate core functionalities.

b. Measure, the MVP undergoes user testing to collect feedback on functionality and usability. This feedback is analyzed to assess whether the system meets user needs.

c. Learn, the evaluation results determine the next steps in system development. If major revisions are needed, the system undergoes a pivot. If the feedback indicates that the system meets expectations, development continues as planned (persevere).

Agile is integrated with Lean Software Development due to its adaptability and iterative development approach [9][10]. Each sprint follows the Build Measure Learn cycle, ensuring that user feedback is continuously incorporated into the system. Through this approach, the internship management information system is iteratively improved to meet the operational requirements of PT. Angkasa Pura II Kantor Cabang Sultan Thaha Saifuddin Jambi.

The Agile Lean Software Development process consists of four main stages: Requirement Analysis, System Modeling, Implementation, and Testing. If testing results meet the predetermined criteria, the process iterates through the Design Implementation Testing cycle, ensuring continuous refinement. This cycle aligns with the principles of Lean Software Development by focusing on delivering value efficiently while minimizing waste [11]. Based on the adopted methodology, the research stages are defined as in Figure 1. From Figure 1, there are four main stages:

i) Requirement Analysis, the initial stage in this research framework begins with requirements analysis. In this stage, all necessary preparations are made to carry out the research process. Activities in the requirements analysis stage include searching for research sources, analyzing information from literature studies, collecting research data, and identifying problems relevant to the study.

ii) System Modeling, uses UML (Unified Modeling Language). UML serves as a design tool that helps developers plan system and user requirements before proceeding to the implementation stage.

iii) Implementation, this stage is the process where the system model and data prepared during the system modeling phase are translated into a functional system through coding and integration. This study utilizes the Agile Lean Software Development (LSD) model, which focuses on an iterative cycle to build a system adaptively and responsively to changing requirements. The system development cycle in this model involves several key stages carried out iteratively, including the Design Sprint, Sprint Planning, Sprint Development, Sprint Review, and Sprint Retrospective.

iv) Testing, after completing the Agile Lean Software Development cycle or the design and implementation stages, the next step is testing. In this stage, the system will be tested by end users to evaluate its overall functionality [12]. The testing process involves Blackbox Testing, conducted by researchers to assess system functionality, and User Acceptance Testing (UAT) to evaluate user acceptance of the system. Blackbox Testing is conducted by demonstrating each feature of the system [13][14]. Blackbox Testing consists of four elements: Input, Expected Outcome, Observation, and Conclusion [15].
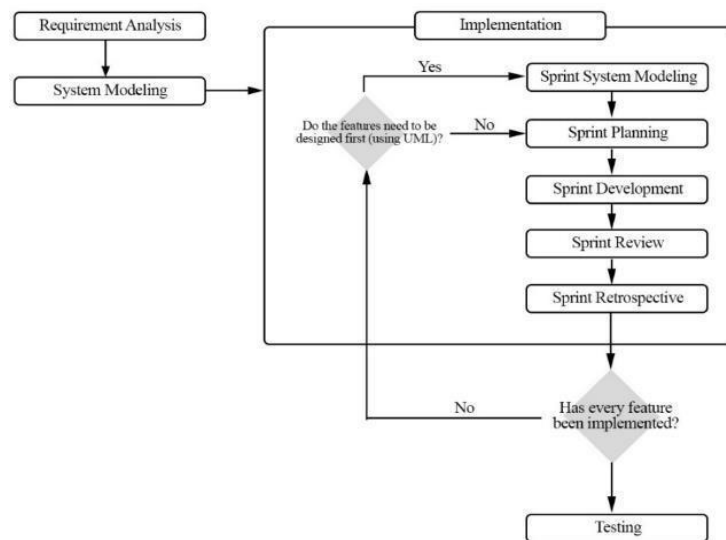

Figure 1. The research stages of Agile Lean Software Development.

User Acceptance Testing (UAT) is conducted by distributing questionnaires to prospective users of the internship management information system. The questionnaire consists of 19 questions, including 5 questions related to design and 7 questions each related to service and efficiency of the internship management information system.

In this study, the purposive sampling method is used to determine the UAT test sample. Purposive sampling is a sampling technique where respondents are selected based on specific criteria that align with the research objectives. These criteria include project stakeholders such as the product owner, users directly involved with the Internship Management Information System, such as administrators and HR personnel responsible for managing interns, as well as several interns who interact with the system.

This method is chosen because it allows researchers to obtain more relevant and accurate feedback from respondents who understand the internship program workflow and the system being tested. The percentage results from each question given to respondents are measured using a 5 points Likert scale [16]. The questionnaire is adapted from a study by Wahyudi et al. [15] on the Solusimedsosku system, adjusted to fit the context of this research. The following Table 1 provide the questions given in the questionnaire.

Table 1. UAT questionnaire [15].

No	Question	Score				
		1	2	3	4	5
	Design					
1	Is the appearance of the internship management information system visually appealing?					
2	Are the menus and features of the internship management information system easy to understand?					
3	Is the color contrast between the text and background appropriate?					

No	Question	Score				
		1	2	3	4	5
4	Is the system in the internship management information system appealing?					
5	Is the font used easy to read?					
Service						
6	Is the service provided by the internship management information system easy to understand?					
7	Does the internship management information system help facilitate the internship management process?					
8	Can the internship management information system be used as a supporting tool?					
9	Overall, is the use of the internship management information system satisfying?					
10	Does the internship management information system meet the necessary requirements?					
11	Does the internship management information system help reduce workload?					
12	In your opinion, does the internship management information system have advantages over other platforms?					
Efficient						
13	Does evaluation through the internship management information system help measure your understanding?					
14	Is the evaluation in the internship management information system aligned with the required needs?					
15	Is the management use of the internship information system appropriate?					
16	Does the use of the internship management information system reduce operational costs?					
17	Is the use of the internship management information system effective?					
18	Is the use of the internship management information system more efficient compared to other methods?					
19	Does this internship management information system application help users understand better?					

The responses from the questionnaire are then processed to determine the success of the system. The processing of questionnaire responses is carried out using a formula outlined in the study by Mahendra et al. [17], as explained in Formula 1 and 2. The questionnaire results' percentage is calculated using the Formula 3.

$$Highest\ Score\ =\ Highest\ Likert\ scale\ score\ \times\ Number\ of\ questions \qquad (1)$$

$$Lowest\ Score\ =\ Lowest\ Likert\ scale\ score\ \times\ Number\ of\ questions \qquad (2)$$

$$\frac{Total\ highest\ score}{Highest\ possible\ value} \times 100\% \qquad (3)$$

Thus, the questionnaire results were obtained in percentage form. The categorization of the system's success level in UAT testing are as follow: (1) Very Bad: 0% - 20%; (2) Bad: 21% - 40%; (3) Neutral: 41% - 60%; (4) Good: 61% - 80%; and (5) Very Good: 81% - 100% [17].

3. RESULTS AND DISCUSSION

3.1. Requirement Analysis

Requirement analysis was conducted through interviews with the staff and internship participants at PT. Angkasa Pura II, Sultan Thaha Saifuddin Jambi Branch. The analysis began with data familiarization, where all responses and field notes were reviewed multiple times to understand the context. Then, initial codes were generated by highlighting significant phrases or statements that reflected problems or needs. For

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example, several interns reported that their logbooks were not supervised by any designated personnel, indicating a lack of oversight. Meanwhile, from the HRD's perspective, there was a recurring difficulty in remembering or tracking the projects completed by each intern, especially when the number of participants was high.

These codes were then grouped into broader themes such as logbook monitoring, project documentation, and performance tracking challenges. The themes were reviewed and refined to ensure they accurately represented the collected data. Finally, themes were defined and named clearly to serve as the foundation for determining functional requirements of the system. The analysis revealed several key issues: difficulties in managing intern schedules and attendance manually, lack of a structured platform for logbooks and reports, and inefficiency in issuing certificates. To address these issues, a web-based internship management information system was designed with core features such as attendance tracking, logbook submission, internship report management, and automated certificate generation. By digitalizing these processes, the system aims to reduce administrative workload and improve data accuracy.

3.2. System Modeling

The system modeling phase focused on defining the system's structure and functionality using Unified Modeling Language (UML) diagrams. This phase began by identifying functional and non-functional requirements to ensure the system meets user expectations. The functional requirements include features such as attendance tracking, logbook submission, internship report management, and certificate generation. Meanwhile, the non-functional requirements emphasize system security, scalability, and ease of use, ensuring the platform operates efficiently for both interns and HR personnel.

A Minimum Viable Product (MVP) was established to guide the development process. The MVP consisted of core features essential for system functionality, including user authentication, attendance recording, logbook submission, report generation, and certificate issuance. These features were prioritized to allow early user feedback and iterative improvements based on Agile Lean Software Development principles. To visualize system interactions, a Use Case Diagram was created, illustrating the roles of interns, HRD, and admins in utilizing system functionalities.
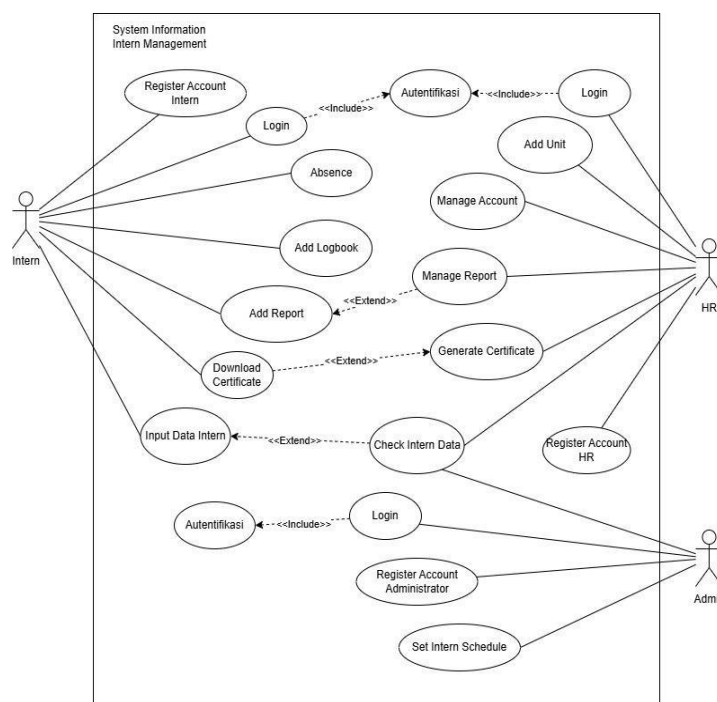
Figure 2. Use case diagram intern management system.

The diagram highlights key processes such as logging in, submitting logbooks, verifying reports, and generating certificates. Additionally, Activity Diagrams were developed to provide a step-by-step breakdown of essential workflows, such as the intern's attendance process and report submission flow. These diagrams helped refine system logic and ensure smooth user interactions.

By incorporating these modeling techniques, the system's design was structured to be both user-centric and scalable, allowing for seamless integration of future enhancements. The iterative refinement of the model ensured that the system aligned with the requirements of PT. Angkasa Pura II, Sultan Thaha Saifuddin Jambi Branch, optimizing internship management processes.

3.3. Implementation

The internship management system was developed based on design specifications using the Agile Lean Software Development approach, ensuring iterative progress with continuous user feedback. Built as a web-based platform, the system utilized Laravel 11 for its robust security and data management and Tailwind CSS for a modern, responsive UI.

The development process was structured into seven sprints, each lasting approximately two weeks. The first sprint focused on UI/UX design and database implementation to establish a solid foundation. In the second sprint, user authentication was implemented, enabling registration, login, and role-based dashboards for HR, Admins, and Interns. The third sprint concentrated on managing intern data and division assignments to ensure an organized system structure. The fourth sprint introduced report submission and certificate management features, streamlining the evaluation and certification process. During the fifth sprint, schedule management and logbook functionality were developed, allowing interns to document daily activities while supervisors monitored their progress. The sixth sprint refined the scheduling module based on user feedback, improving its usability and efficiency. Finally, the seventh sprint focused on system finalization, incorporating bug fixes, performance optimizations, and usability enhancements before deployment.

Each sprint followed a Build-Measure-Learn cycle, ensuring continuous improvements. Functional validation was conducted using black-box testing, allowing early issue detection and resolution. The development prioritized iterative implementation, beginning with authentication before expanding to intern data management, scheduling, logbook submission, report handling, and certification management. This approach ensured that the system was stable, user-friendly, and aligned with its intended requirements before final deployment. Several main features of the system were implemented, depicted in Figure 3 to Figure 7.

   a. User Authentication (Login, Logout, and Account Registration). This page ensures secure access for different user roles, including interns, HRD, and admins.
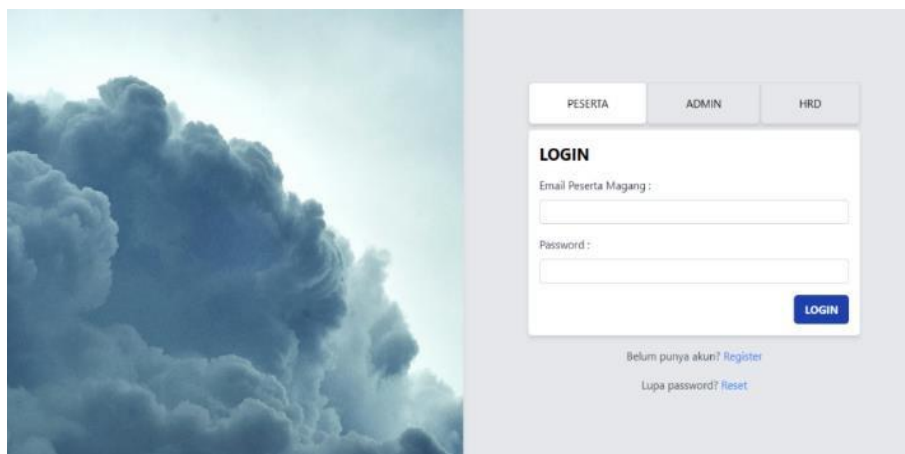

Figure 3. Login page.

b. Intern Data Management. At this page, interns can input and manage intern data.

Figure 4. Insert intern data.

c. Schedule, Attendance, and Logbook Management. Admins can set intern work schedules, and interns can check in and check out through the attendance system while recording their daily activities in the logbook.

Figure 5. Absence and logbook.

d. Internship Report Submission. At this page, interns can upload internship reports for review by HRD.

Figure 6. Upload report.

e. Internship Certificate Management. HRD can generate, approve, and provide downloadable certificates for interns upon program completion.
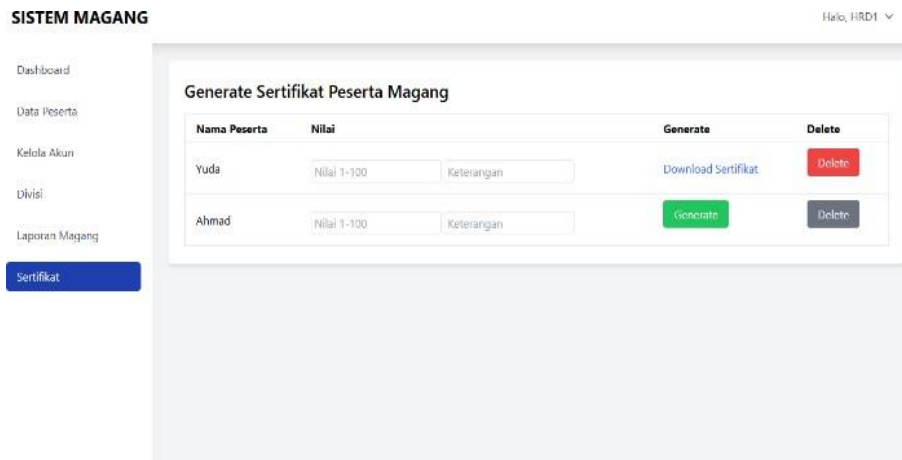

Figure 7. Generate certificate.

These images demonstrate how users interact with the system, from logging in to managing attendance, submitting reports, and downloading certificates. Throughout the implementation phase, continuous integration and testing were conducted to minimize errors and optimize system performance. The developed system successfully aligned with the functional and non-functional requirements, ensuring efficiency in managing internship processes at PT. Angkasa Pura II, Sultan Thaha Saifuddin Jambi Branch.

3.4. Testing

The testing phase aimed to evaluate the system's functionality, usability, and reliability based on predefined requirements. Functional testing was conducted to verify that each feature operated correctly according to the system's specifications. This included testing user authentication, data input and retrieval, schedule and attendance management, logbook submission, report uploads, and certificate generation. Each function was tested with Blackbox testing to identify and resolve potential issues. User Acceptance Testing (UAT) was conducted to determine the system's level of acceptance by end users. The UAT involved seven respondents, who tested various system functionalities, as the results can be seen in Table 2.

Table 2. UAT result.

No	Question	Score				
		1	2	3	4	5
	Design					
1	Is the appearance of the internship management information system visually appealing?			4	3	
2	Are the menus and features of the internship management information system easy to understand?				5	2
3	Is the color contrast between the text and background appropriate?				6	1
4	Is the system in the internship management information system appealing?			4	3	
5	Is the font used easy to read?				7	
	Service					
6	Is the service provided by the internship management information system easy to understand?				7	
7	Does the internship management information system help facilitate the internship management process?			1	5	1
8	Can the internship management information system be used as			2	3	2

No	Question	Score				
		1	2	3	4	5
	supporting tool?					
9	Overall, is the use of the internship management information system satisfying?				6	1
10	Does the internship management information system meet the necessary requirements?			2	5	
11	Does the internship management information system help reduce workload?				7	
12	In your opinion, does the internship management information system have advantages over other platforms?			4	3	
	Efficient					
13	Does evaluation through the internship management information system help measure your understanding?			3	4	
14	Is the evaluation in the internship management information system aligned with the required needs?			3	4	
15	Is the use of the internship management information system appropriate?				3	4
16	Does the use of the internship management information system reduce operational costs?			2	5	
17	Is the use of the internship management information system effective?				5	2
18	Is the use of the internship management information system more efficient compared to other methods?				6	1
19	Does this internship management information system application help users understand better?				7	
	Total	0	0	25	94	14

The total evaluation score calculated using the Likert scale: $(25 \times 3) + (94 \times 4) + (14 \times 5) = 521$. Using Formula 1, the highest score is: $5 \times 133 = 665$. Based on these values and Formula 3, the success percentage obtained is 78%, which also shows acceptance rate that falls within the "Good" category (61%-80%). This indicates that the system is well-received and meets user needs, with some areas for improvement. Identified minor issues were addressed in subsequent iterations to enhance the overall system experience. While these results demonstrate notable improvements in the internship management processes, several challenges were encountered during implementation. One significant limitation is that the developed system has not yet been integrated with other existing systems within the airport's operational environment, which may limit its efficiency in broader organizational workflows. Moreover, the biggest challenge faced during the implementation phase was the difficulty in maintaining consistent communication and conducting direct meetings with stakeholders from the airport authority. This occasionally hindered the review process and delayed feedback, which are critical in an Agile development cycle.

4. CONCLUSIONS

This study concludes that the development of a web-based Internship Management Information System using the Agile Lean Software Development methodology successfully produced a functional system that meets user needs. The iterative Build-Measure-Learn approach allowed for continuous improvement based on user feedback, ensuring that the system remains adaptive and aligned with organizational requirements. The system facilitates internship data management, including user authentication, participant data input, schedule and attendance tracking, logbook submissions, report uploads, and certificate issuance. Through functional and usability testing, the system demonstrated reliable performance. Additionally, User Acceptance Testing (UAT) yielded a 78% acceptance rate, indicating that the system is well-received and effectively supports the internship process. Furthermore, the system serves not only as a management tool but also as a potential research resource for future improvements and expansions. The structured approach used in this study provides a foundation for further enhancements, such as automation features, advanced analytics, and integration with external platforms to improve overall efficiency.

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