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Research Article

The Development of an Integrated Cloud-based System to Enhance Internship Management

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Abstract

The internship program is commonly imposed as the partial fulfilment of a degree at the university level. It is a platform where knowledge and theory learned in the classroom can be applied to real working environments, indirectly preparing the students for their future careers. However, the increasing complexity of managing intern attendance and performance tracking in internship programs necessitates a streamlined and efficient solution. More attention should be paid to internship programs to meet the growing competitive job market's needs and fulfil the university requirements. This paper presents the development of *E-Kehadiran*, a web-based management system to address these challenges. The primary objective of this system is to enhance the accuracy and efficiency of attendance tracking and logbook submissions, thereby improving the overall management of internship programs. The development process involved creating a comprehensive use case diagram to identify and define the interactions between key actors: Super Admin, Supervisor, and Intern (Student). The system features robust functionalities including user registration, secure login, attendance management and logbook handling. Initial deployment and user feedback demonstrate that *E-Kehadiran* significantly improves administrative processes, ensures accurate record-keeping, and facilitates effective performance monitoring by university and company supervisors. This system fosters better communication and collaboration between educational institutions and industry partners, ultimately supporting the success and development of interns.

Keywords: attendance monitoring, internship management, logbook submission.

INTRODUCTION

The internship program is an experience of short-term workplace practical experiences which provide opportunities for students to enter the job market during and after their undergraduate course programs. The internship was generally assessed as highly effective and positively affects the employability skills development and the attitude towards future career (Bawica, 2021). The findings in (Thi Ngoc Ha, & Dakich, 2022) highlighted the crucial role of industry stakeholders, including academic and company supervisors in the entire process of the internship, as well as the key responsibility of universities in improving student internship experiences (Hasbullah et al., 2022).

Academic internships are a bridge to link the theory (Mokhtar, 2019) and practice by taking part in supervised and scheduled work. The internship programs not only improve students' skills and learn teamwork but also polish their professional growth and experience. Internship programs enable students to get training during their course programs which indirectly, supply valuable employees and competent job applicants to the companies (Anjum, 2020). In other words, curricular-based internship opportunities prepare the students to attest to their career interests and solidify their career goals while gaining transferable skills from the companies, which indirectly increases the employment marketability of university graduates (Lajara, 2022, Mohamad Kasim et al., 2023).

However, interns sometimes face poorly structured programs with inadequate supervision. This can result in unclear expectations, lack of meaningful tasks, and insufficient feedback, diminishing the learning experience and professional growth (Samuri et al., 2016). Both supervisor mentoring (i.e., providing clear directions and feedback) and supervisor support (i.e., how well the supervisor cares about employee well-being) are positively related to outcomes. Supervisors play a vital role in the interns' experience since they represent their organization and the profession itself.

Supervisors are the ones who should provide guidance, encouragement, and resources regarding the students' career plans (Hora et. al, 2020). The percentage of unemployability can be reduced when the university works closely with the participating host companies (Sudin et al., 2022). The host companies can suggest appropriate training areas and recommend suitable specific tasks, assignments and projects, which can be evaluated by both the academic and industry supervisors (Tonot, 2022).

However, keeping track of the intern's attendance (indirectly their performance) can be challenging because different companies may have different attendance policies, different than those applied at universities. Integrating these policies and ensuring that internship students adhere to them can be challenging. Some policies and mechanisms used by companies to keep track of the attendance of the intern are shown in Table 1 and Table 2 below:

Table 1: Types of attendance policies

Policy	Implementation Method
Fixed Schedule	Interns are required to adhere to a fixed schedule, typically mirroring the standard working hours of full-time employees (such as Monday to Friday, 9 AM to 5 PM).
Flexible Schedule	Interns are allowed to set their working hours within a range, as long as they complete the required number of hours per week.
Part-Time Schedule	Interns work fewer hours than full-time employees, often to accommodate their academic schedules.
Remote Work	Interns are allowed to work from home or any remote location. Interns complete their tasks and check in with supervisors via video calls and online collaboration tools.
Hybrid Schedule	Interns split their time between working on-site and remotely. Combines the benefits of in-person interaction and remote flexibility.

Table 2: Types of common attendance systems used for interns

Mechanisms	Description
Manual Tracking Systems	Attendance is tracked manually using paper timesheets or Excel spreadsheets.
Electronic Time Clocks	Interns use electronic time clocks to log their arrival and departure times. Interns swipe an ID card or enter a code on a time clock device at the office entrance.
Biometric Attendance Systems	Uses biometric data (e.g., fingerprints, facial recognition) to track attendance. Interns scan their fingerprints or faces at a biometric terminal upon entering and leaving the office.
RFID Systems	Uses Radio Frequency Identification (RFID) cards or tags to log attendance. Interns swipe an RFID card at an entry terminal when they arrive and leave.

It is common that at universities or college levels, the internship programmes are monitored by the Industrial Training Coordinator (ITC) and an academic supervisor will be assigned to each student. One of the responsibilities of the ITC as well as the academic supervisor is to ensure that students comply with both academic and internship attendance requirements, which can be difficult. The main issue is how to track the attendance of the interns at companies. Universities need a reliable system to track students' attendance during internships.

Although regular monitoring is usually performed at the company level, this can be difficult if companies do not provide regular updates to universities or if there is no standardized reporting system, which causes any discrepancies to fail to be addressed promptly. On the other hand, students sometimes may fail to maintain accurate records of their attendance, leading to discrepancies and issues with academic credit allocation.

Though different organizations would have different natures of fields, types of work or even standard operating procedures, both employers and education providers should give attention to ensure that the internship program experienced by students is profound and significant. Some students even expressed their hope for more visits and phone calls from their lecturers, to investigate if things were going in the right direction and assist in unsolved problems.

On the other hand, the challenges faced by employers in implementing the internship program are the cost of training and supervising new interns. Typically, employers assign supervisors or staff to train, supervise and evaluate interns during the training. The training incurs an indirect cost to the company as the time spent by the supervisors or staff can be utilized to do their jobs.

In some cases, interns need special attention and continuous supervision due to their lack of knowledge, skills, and abilities. Effective internship planning requires genuine interest from the coordinator, adequate resources and support from the faculty, as well as systematic planning and evaluation procedures by the industry (Soffi, 2020).

Since interns may not be as motivated or engaged as regular employees, sometimes this would lead to attendance issues. Although it is common for an intern to be placed under the supervision of a dedicated staff at the company level, companies need to find ways to keep interns engaged and committed to their roles. On the other hand, supervising and monitoring intern attendance and performance can be resource-intensive, requiring dedicated personnel and resources.

To enhance the overall internship experience for students and ensure that all parties benefit from the program, both universities and companies must manage internship attendance more effectively. Clear and standardized policies for attendance management, including procedures for reporting and verifying attendance should be developed. This could be achieved through the development of an integrated system. An integrated attendance tracking systems that allow for real-time updates and easy access to attendance records for both universities and companies could be implemented.

METHODOLOGY

One effective solution that can be implemented is an integrated cloud-based system that allows interns to log in via web or mobile applications. The interns' clock-in and clock-out data can be synced in real-time with a central database, accessible by the human resource department, the academic supervisor, and the assigned company staff.

Rapid Application Development (RAD) (as shown in Figure 1) is considered for developing the *E-Kehadiran* system due to its versatility and flexibility (Zamzuri et al., 2024; Azman et al., 2024). It allows for changes and modifications during development based on user feedback while still meeting standards.

The project can be divided into smaller tasks, each with a clear goal, helping developers stay focused and improve productivity. Smaller tasks are easier to estimate, allocate, and track, making it simpler to manage resources and timelines. RAD helps developers understand the status of individual modules, making resource and time management more efficient.

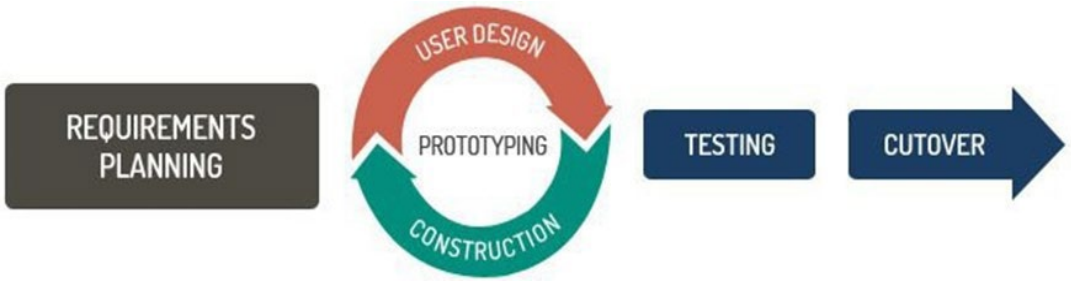

Figure 1: Phases of Rapid Application Development (RAD)

Before developing the system, the requirements gathering was performed by identifying the stakeholders including university administrators, company human resources, supervisors (both from university and company), and interns. From the feedback of the stakeholders, their needs and expectations can be identified. The main functional requirements of the system include user management, attendance tracking and reporting.

In the prototyping phase, the initial design involves developing basic layouts and interfaces for sections like profile overview, attendance tracking, and logbook updates in accordance with the needs and preferences of end-users (considering a simple, easy-to-navigate user interface (UI)). Prototypes of these interfaces are created to gather feedback from stakeholders and end-users, which is then used to refine the design. Use case diagrams and data flow diagrams (DFD) are developed to illustrate the system flow and database connections. These diagrams help in reducing misunderstandings during development.

The testing phase is a key step to ensure the software works correctly. Three testing phases involve are unit testing, unit integration testing, system testing, and acceptance testing. Unit testing focuses on checking each part of the software separately. Each unit is tested to ensure it works correctly and meets the requirements. Unit integration testing checks how different parts of the software work together. It ensures that combined components function correctly.

This testing finds and fixes issues with data and functionality that might happen when different parts are integrated. System testing, on the other hand, checks the whole software program to ensure it meets all requirements and works well in its intended environment. It examines the entire system, including all parts, how they interact, and how they connect with other systems. The goal is to make sure the software works correctly in real-life situations.

The last one is acceptance testing in which the software gets checked against the user requirements and acceptance. This is to ensure that the developed software meets the user's expectations. The final phase, cutover refers to the software which is ready for real action.

PROPOSED SYSTEM DESIGN

The system design involves developing use case diagrams and data flow diagrams, as discussed below.

Use Case Diagram

The use case shown in Figure 2 below shows three main users of this attendance system, which are super admin, supervisors and students (interns), which outlines the interactions between different users and the system's functionalities. Three primary actors are identified: Super Admin, Supervisor, and Student. The Super Admin can register students and supervisors, as well as set access for the login system. Both the Super Admin and Supervisor can log in to the system, view and update profiles, manage attendance (add, view, update, delete), and handle logbooks (add, view, update, delete). Additionally, the Supervisor can view student information. This diagram delineates the various tasks each actor can perform, emphasizing the comprehensive and integrated nature of the system for efficient attendance and logbook management.

Figure 2: Use case diagram of the *E-Kehadiran* system

Data Flow Diagram (DFD)

Figure 3 shown below is a DFD for the *E-Kehadiran* attendance management system, detailing the flow of data between different entities and processes within the system. The diagram includes three primary actors: Super Admin, Supervisor, and Students, each interacting with various system processes.

Super Admin can register supervisors, log in to the system, add attendance, update attendance, delete attendance, and view attendance records. The supervisor can log in, view and update profiles, manage attendance records (view, add, update, delete), and handle logbook entries (view, add, update, delete). They can also view student profiles. Students can log in, view and update their profiles, and manage their own attendance and logbook entries.

Each process is numbered and connected to show the flow of data. For instance, the login process (1) is shared by both Super Admin and Supervisor, while the attendance management processes (14, 15, 16, 17) and logbook management processes (18, 19, 20, 21) are connected to both Supervisor and Students. This DFD provides a clear and structured visualization of how data moves through the *E-Kehadiran* system, ensuring efficient management of attendance and logbook records.

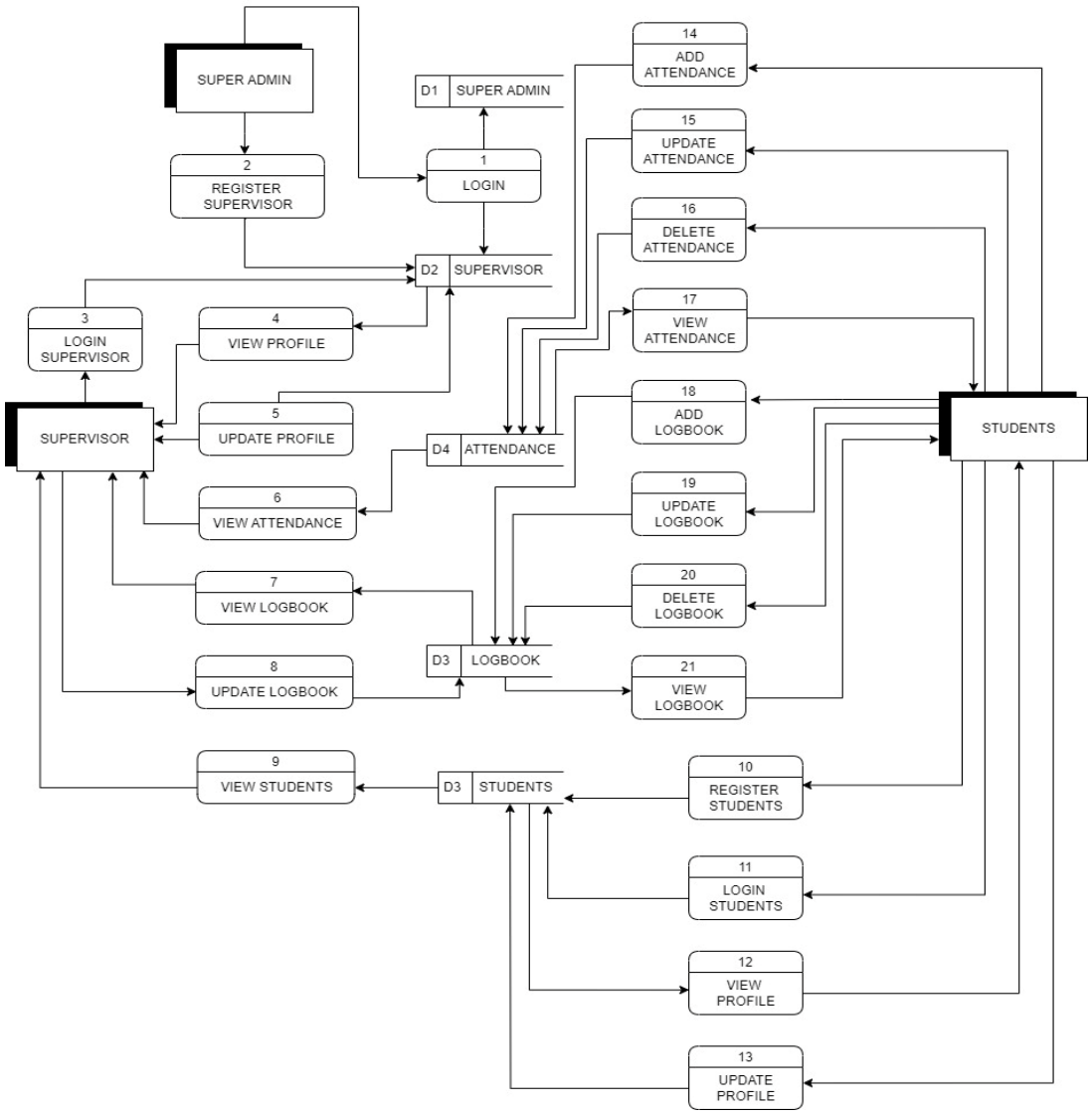

Figure 3: DFD of the *E-Kehadiran* System

RESULTS – SYSTEM INTERFACE

Three main features of the *E-Kehadiran* system include user registration, attendance record and logbook submission.

User Registration

Figure 4 below shows the intern registration page, in which students must go through the registration process before accessing the system. Students must enter their details, such as full name, e-mail address, phone number, section/department, university, the internship start and end date, and password, to complete the registration. Once these details have been filled in, the intern should click the 'Daftar' button to complete the user registration process.

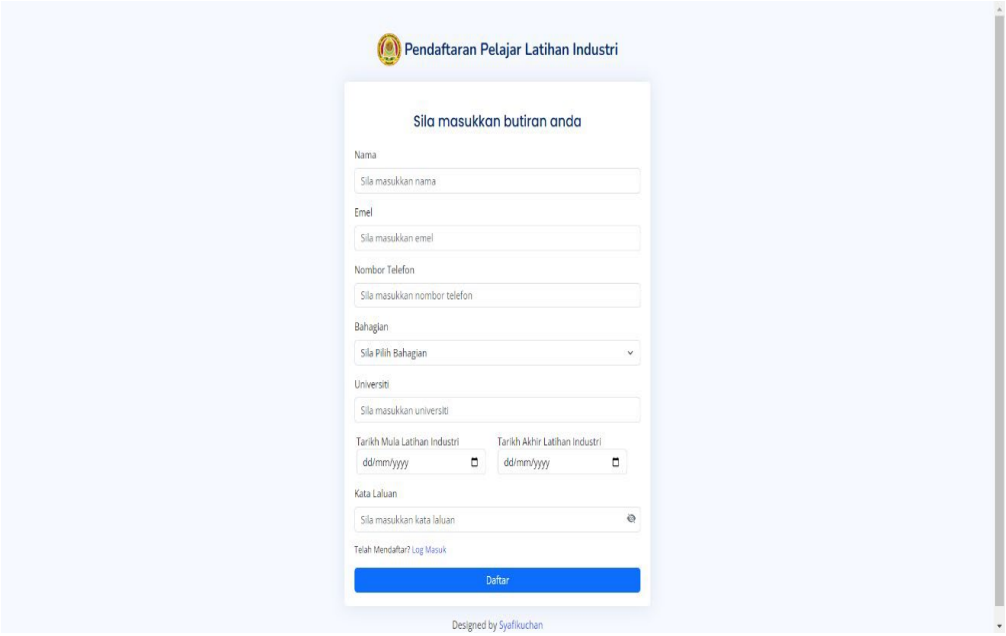

Figure 4: Registration page for intern

Once the registration has been completed, the intern can log into the *E-Kehadiran* system using their email and password, as shown in Figure 5.

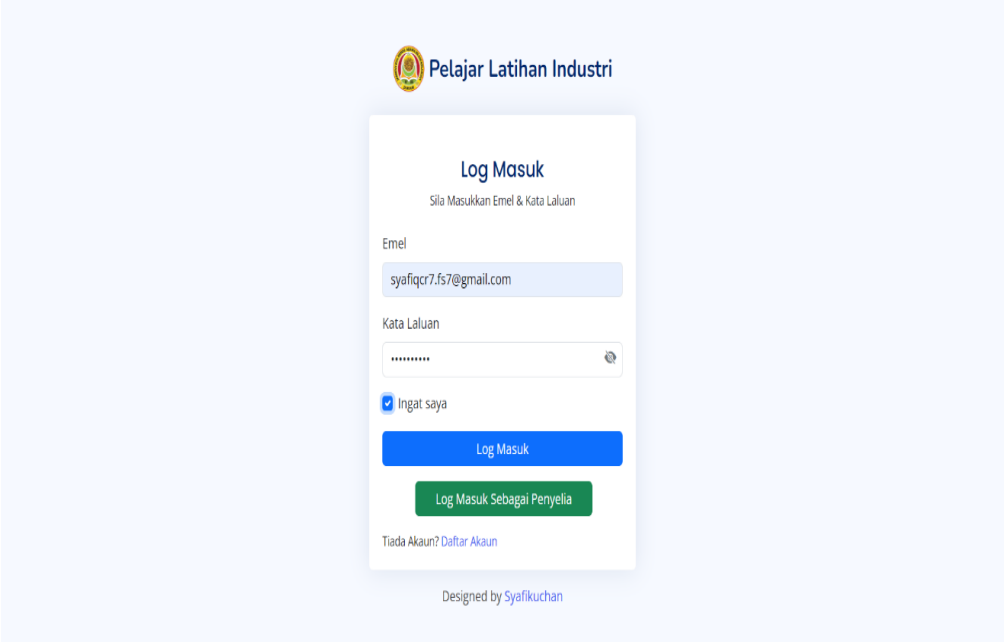

Figure 5: User login page

After successfully logging in, the intern is directed to the user profile page, as shown in Figure 6 below. The intern will be displayed with a profile overview. On this page, the intern can navigate to update the

profile as well as the password (shown in Figure 7 and Figure 8 respectively). The intern can edit all the personal information except the e-mail address. Details update can be done by entering the field with the updated information and finally clicking the ‘Kemaskini Profil’ button.

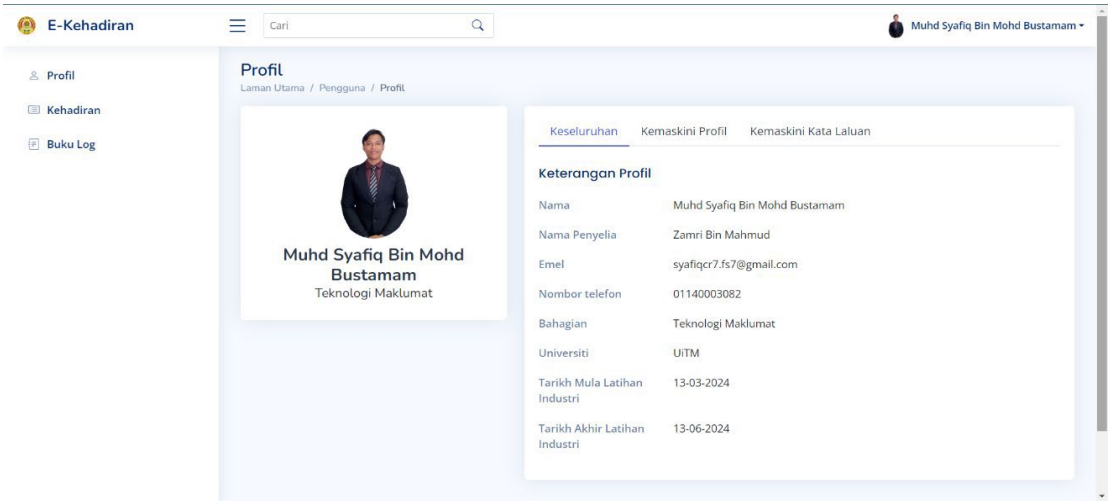

Figure 6: Intern’s profile page

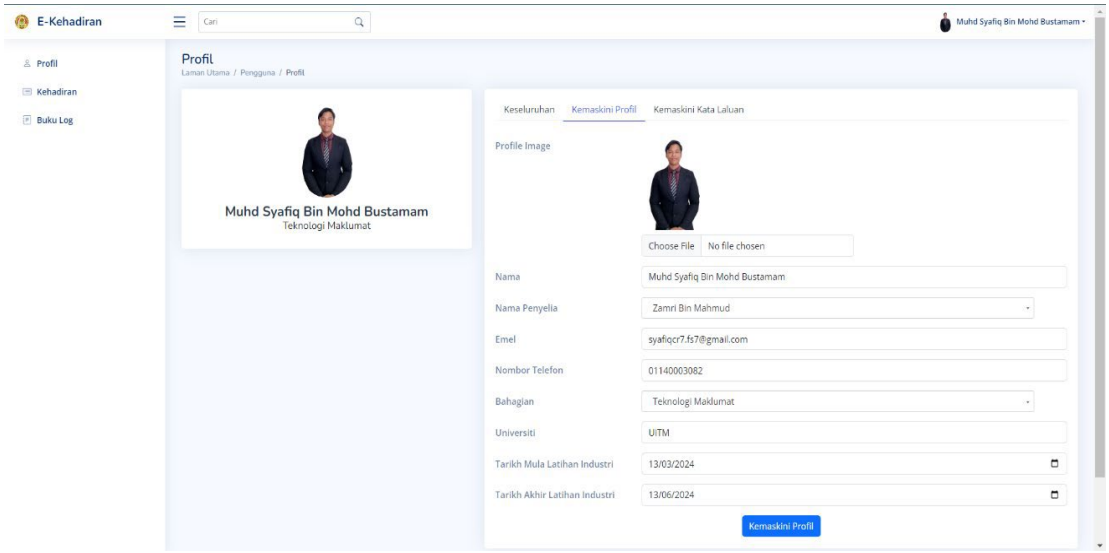

Figure 7: Profile update page

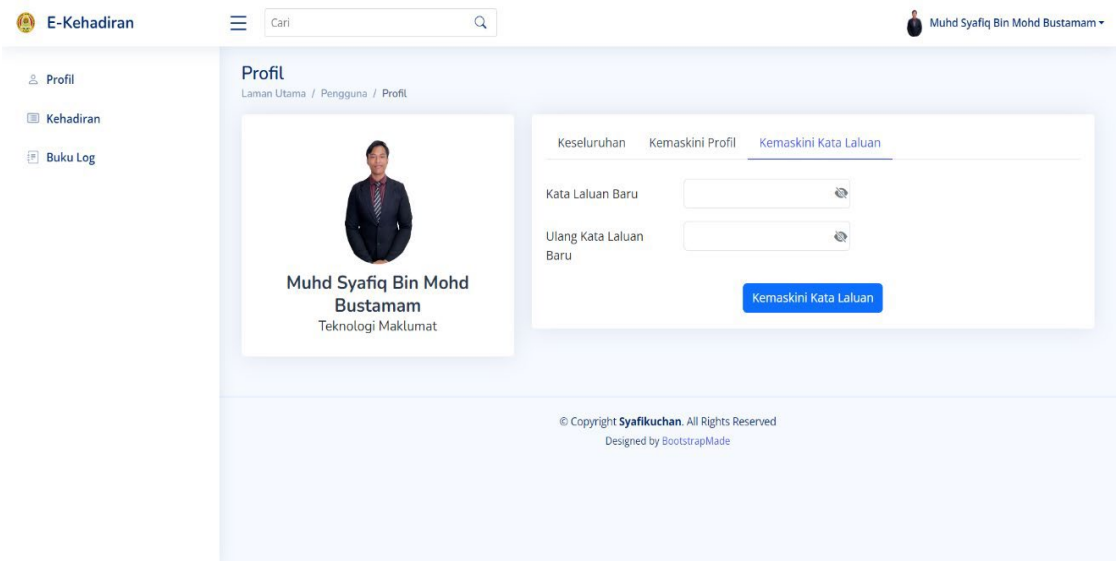

Figure 8: Password update page

The process of account registration, login page and profile view update for the supervisors are like the ones presented above for the intern's account. A sample of a supervisor's profile page is shown in Figure 9 below. The supervisor's account has an additional tab 'Pelajar Latihan Industri' on the left compared to the intern's account.

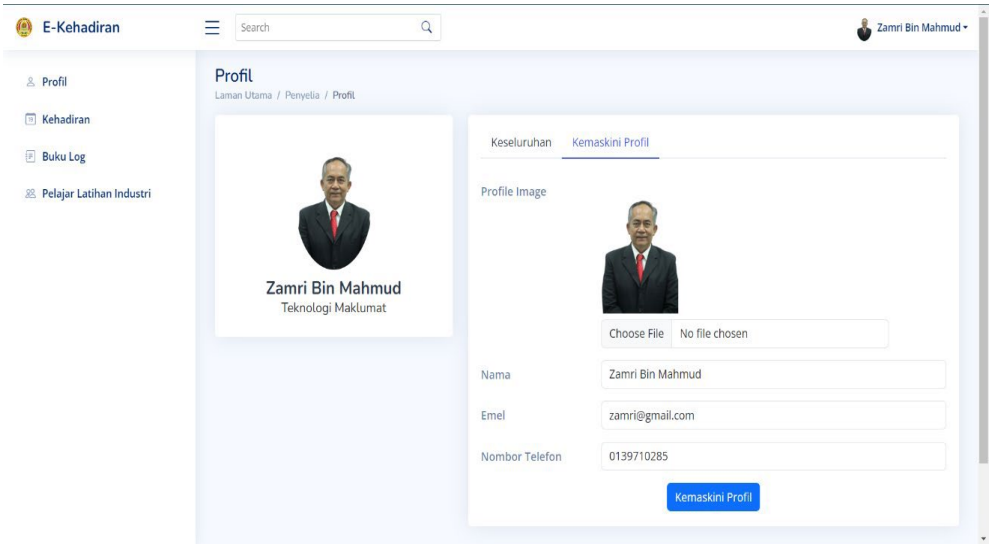

Figure 9: Supervisor's profile page

Attendance Record

On the left side of the Intern's Profile Page (refer to Figure 6), there is the 'Kehadiran' tab, which when clicked, will display the attendance records of an intern in the format of a calendar as shown in Figure 10. The intern can view the previously entered attendance entries and status on specific dates. The same data

is also accessible to the human resource department and supervisors. This feature indirectly helps the human resource department and supervisors to stay informed and updated on the attendance of the intern under their supervision.

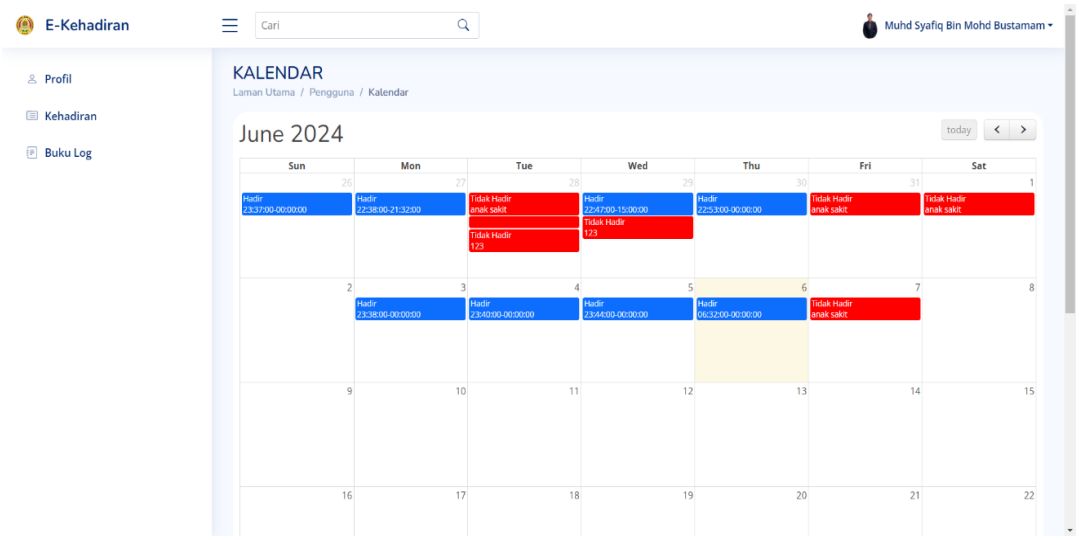

Figure 10: Attendance record – Intern's view

The intern can add the new attendance entry by filling in the status, specific date and time in a form displayed on this page to confirm their presence (shown in Figure 11). Once submitted, the attendance record will be updated with the 'Hadir' status.

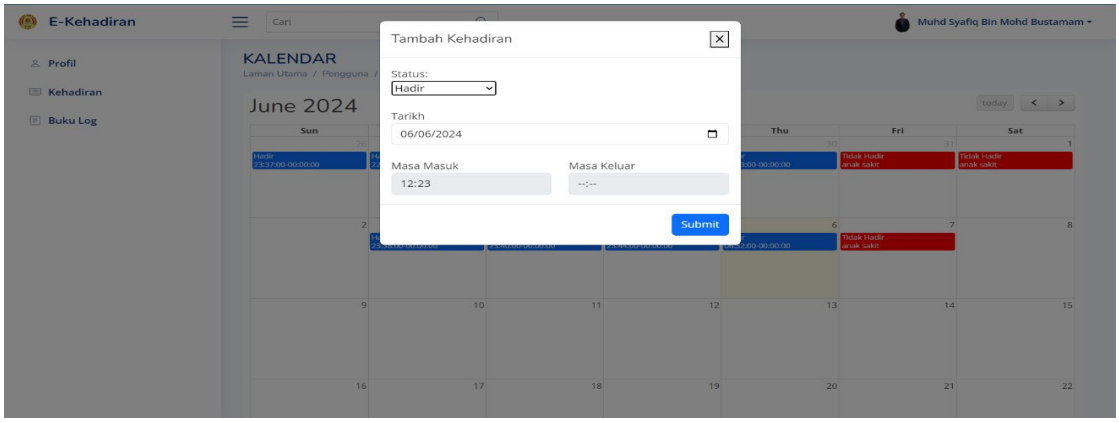

Figure 11: Adding a new attendance record

However, in case the intern needs to update the absence record, the status 'Tidak Hadir' should be selected. For absence records, different forms will be displayed (as shown in Figure 12). The specific reason for the absence should be provided, and a document of proof should be uploaded to the system.

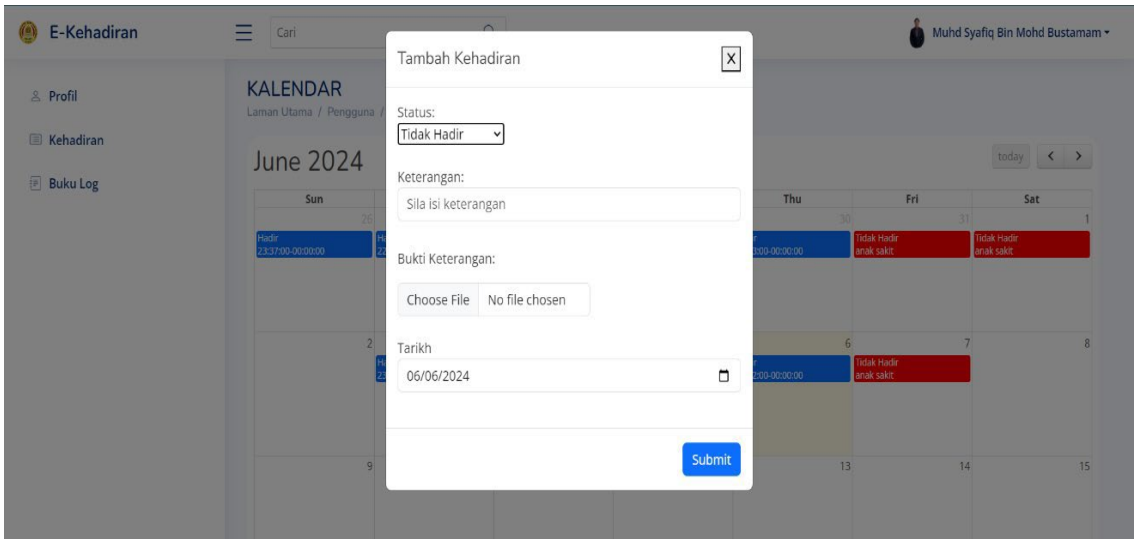

Figure 12: Adding an absence record and document of proof

Attendance Monitoring

From their profile page, both academic and company supervisors can view a list of interns (and their details) under their supervision as shown in Figure 13 below. This feature is accessible by clicking the last tab on the left side of the page.

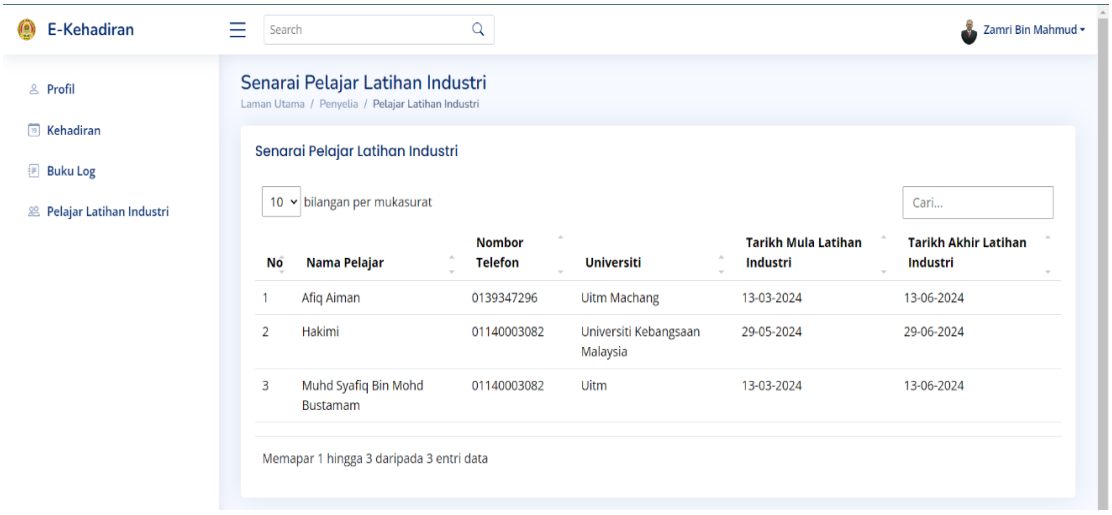

Figure 13: List of interns

By clicking the ‘Kehadiran’ tab, the supervisors can view the attendance records of the interns as shown in Figure 14. The page displays an attendance list of names, statuses, information, date and time. The ‘Search’ field on the top of the page can be used to filter the list based on specific interns, statuses, dates and times.

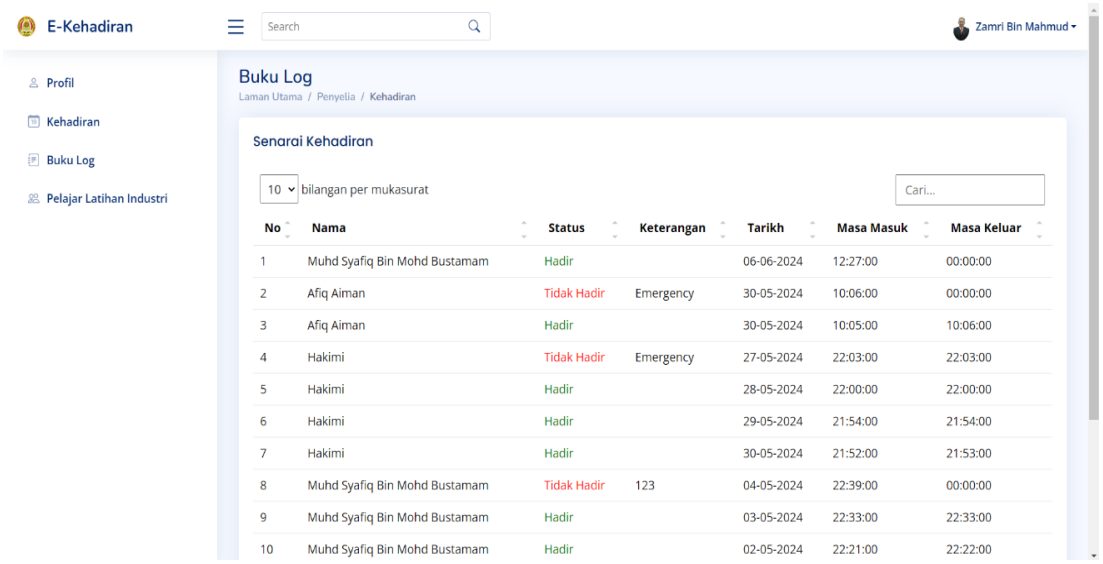

Figure 14: Supervisor's view of the interns' attendance

Logbook Submission

In the logbook section, the interns can view their logbook submission records. This section displays a list of their logbook submission entries, including date, information and status whether it has been checked by the supervisors or not. The interns can easily review their logbook submission entries to ensure accuracy and keep track of their progress.

Interns can create a logbook entry by choosing the 'Buku Log' tab on the left side of the intern's profile page. The tab will display a page as shown in Figure 15 below.

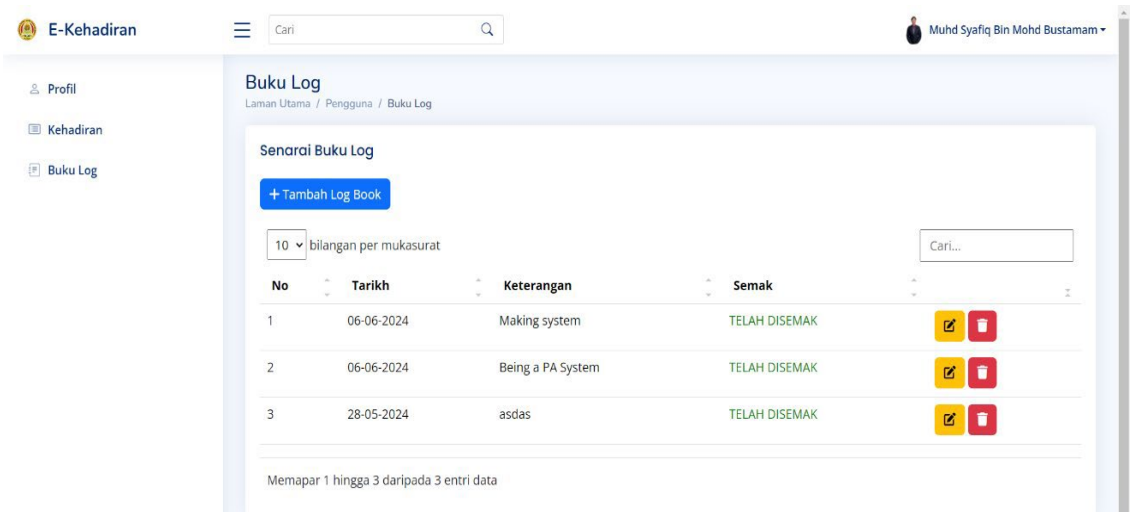

Figure 15: A list showing logbook entries that have been added previously and their status

By clicking the 'Tambah Log Book' button, a new log book entry can be added by filling in the required

fields (refer to Figure 16).

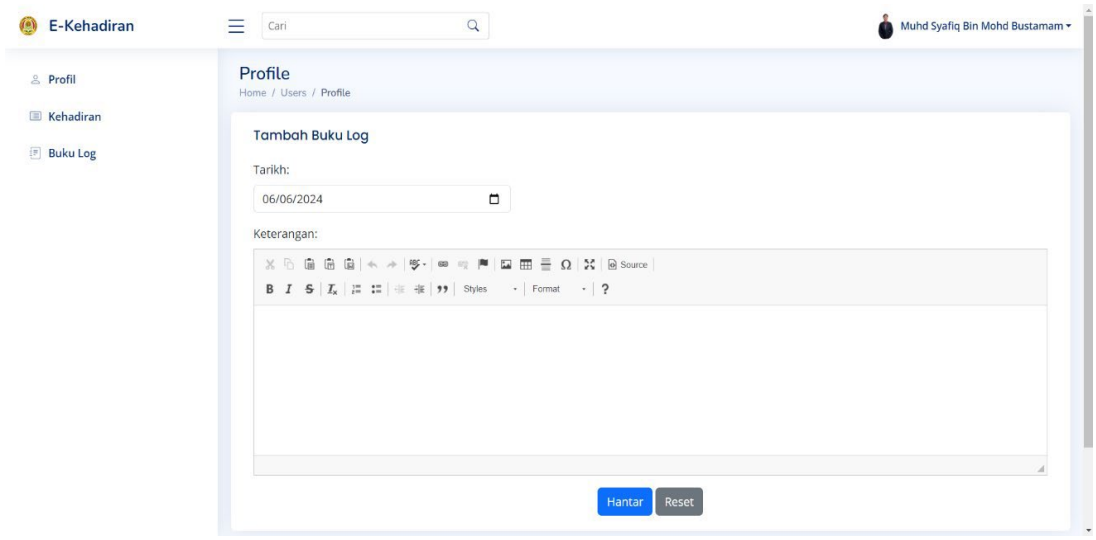

Figure 16: Adding a new logbook entry

Once the 'Hantar' button is clicked, the confirmation page as in Figure 17 will be displayed indicating a successful addition of a new logbook entry.

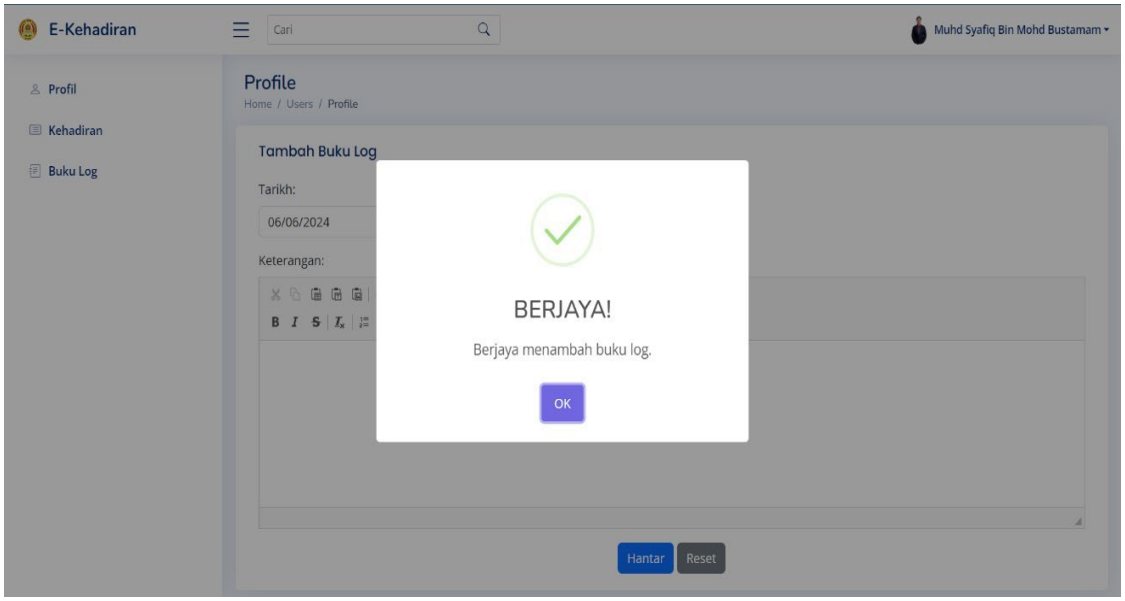

Figure 17: A new logbook entry was successfully added

Verification of Logbook Submission

The supervisors may view all the logbook submission entries and their statuses as shown in Figure 18.

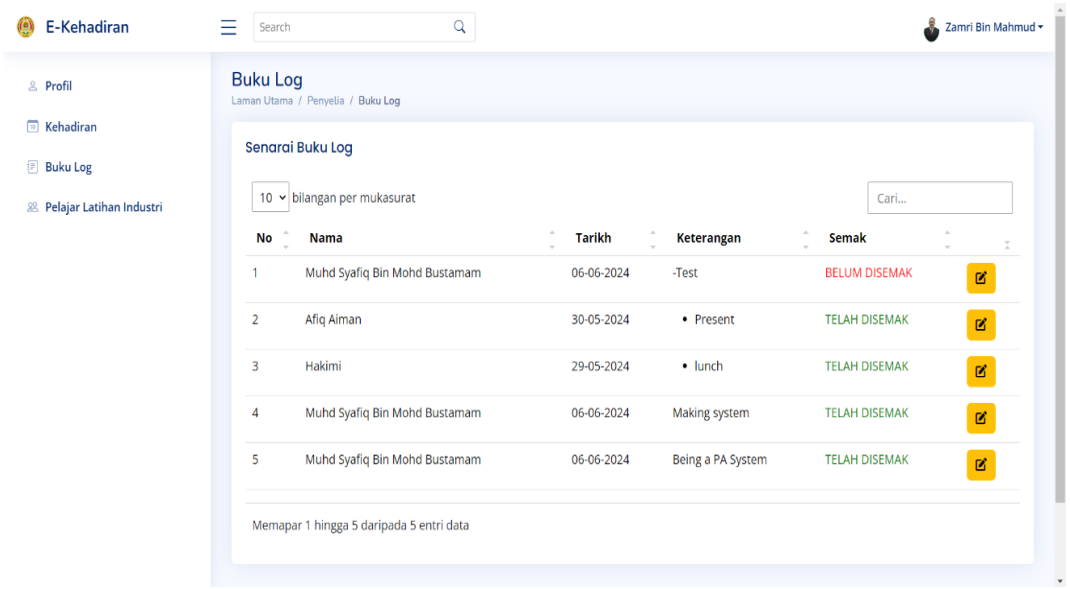

Figure 18: A list of logbook submissions and statuses

The supervisor can click the yellow edit button menu at the end of each logbook entry to see and verify the submission. If the logbook submission is satisfactory, the supervisor may change the status from 'Belum Disemak' to 'Telah Disemak', indicating that the supervisor has checked and approved the logbook submission as shown in Figure 19.

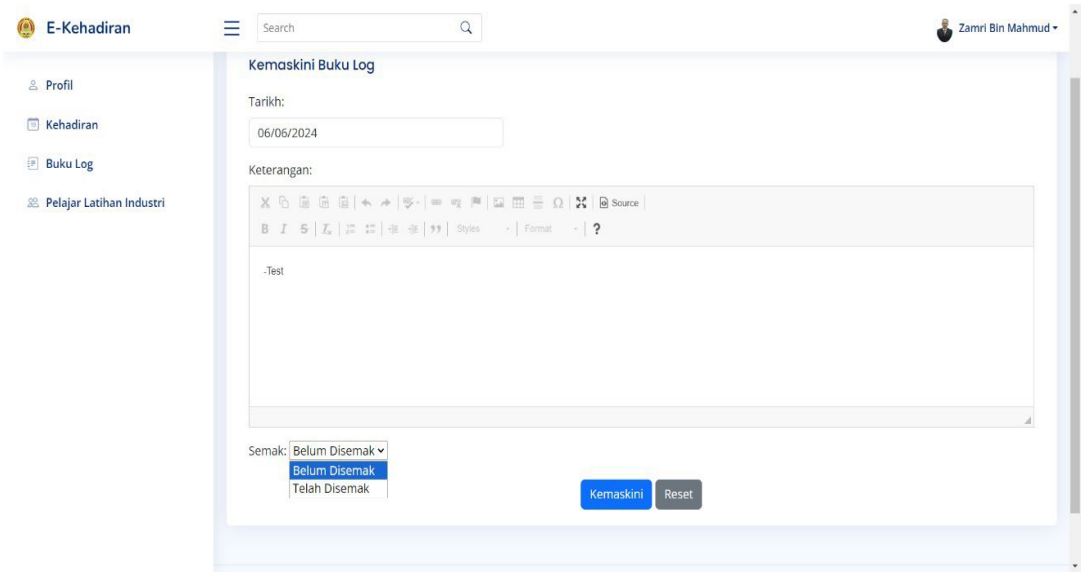

Figure 19: Verification of logbook submission by supervisor

RESULTS – USER ACCEPTANCE TEST

The acceptance testing was conducted by distributing questionnaires to a total of 26 respondents who were randomly selected among computer science department students, lecturers (academic supervisors) and industry supervisors. In evaluating the system's usability, the Heuristics Evaluation employs the System Usability Scale (SUS), a widely recognised tool consisting of a questionnaire with a scale ranging from 1 (strongly disagree) to 5 (strongly agree).

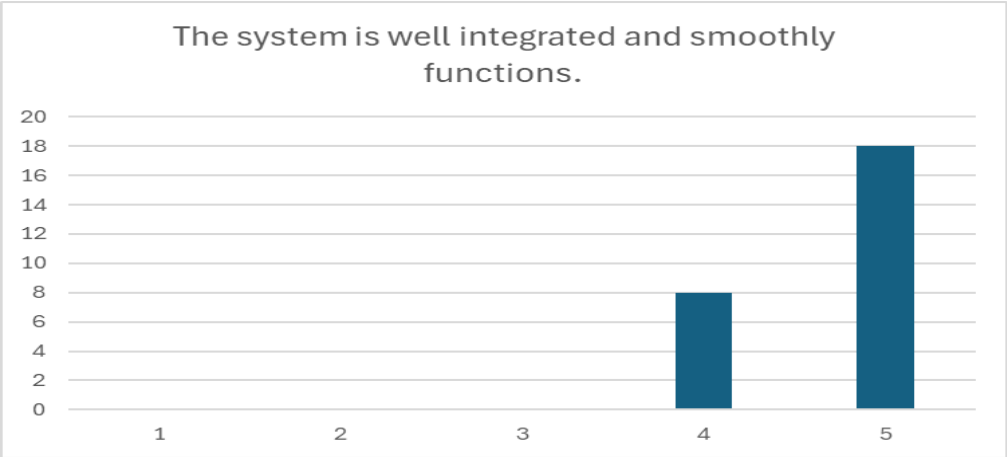

Figure 20: Integration of functions

As shown in Figure 20, most of the respondents (18 out of 26) expressed strong agreement, and none expressed dissatisfaction, indicating overall positive feedback regarding the system's integration and functionality. This indicates that the system is considered well-developed and efficient by most of the users who participated in the testing.

According to Figure 21, the response results indicate that the vast majority of users (17 out of 26) strongly agree with the system's ease of use, while the remaining 9 respondents also view the system positively in terms of simplicity. This suggests that the system is highly user-friendly and accessible, which is a critical success factor in usability, especially when targeting a broad user base.

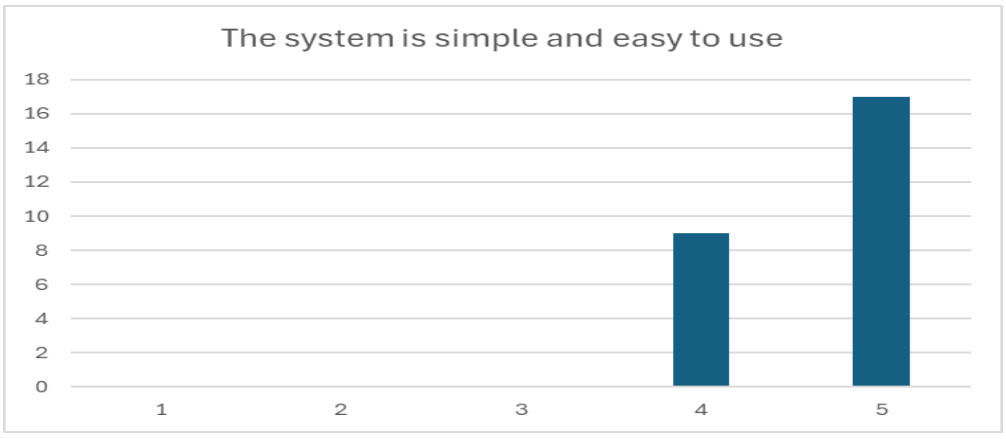

Figure 21: Ease of use and simplicity of the system

In Figure 22, 21 out of 26 respondents strongly believe that the system significantly improves the efficiency of managing the internship process. The remaining 5 respondents also agree but to a slightly lesser degree. This strongly suggests that the system is highly effective in streamlining and improving the management of the internship process, making it a valuable tool for enhancing process efficiency in this domain.

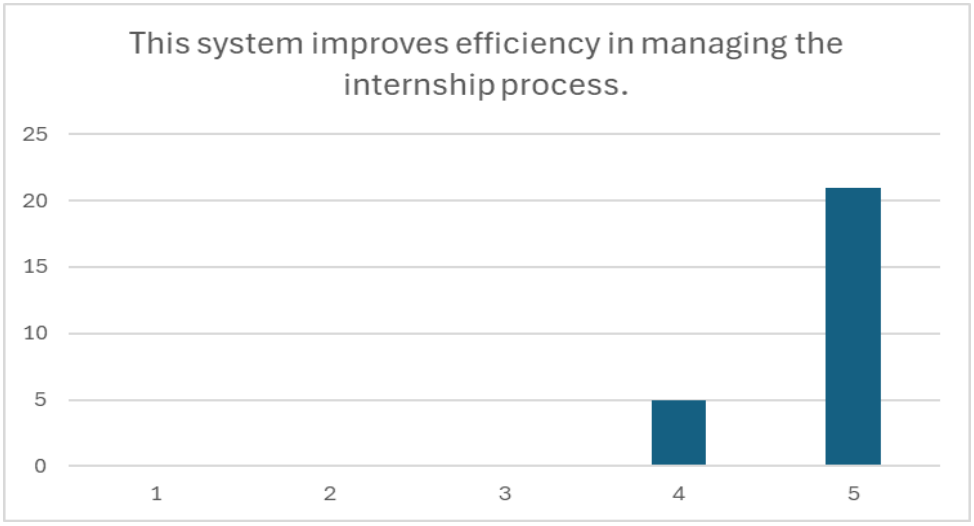

Figure 22: Efficiency of the System

CONCLUSIONS

In conclusion, the development of the attendance management system for interns represents a significant step towards enhancing the efficiency and accuracy of attendance tracking and logbook submissions. The functionality and usability of the *E-Kehadiran* system were achieved through rigorous system testing involving real users who provided valuable feedback on the website's performance. The results confirmed that the system is practical, intuitive, and well-received by its users to provide efficiency in managing the internship process.

This system not only streamlines the process for interns and supervisors at both the university and the company but also provides a reliable platform for monitoring student performance. By integrating key functionalities such as attendance management, logbook submission, and performance tracking, the system addresses the needs of all stakeholders involved, ensuring a more structured and transparent internship experience. The successful implementation of this system underscores its potential to improve administrative processes and foster better communication and collaboration between educational institutions and industry partners.

FUTURE WORK

In future work, GPS-enabled functionality will be added to this web-based attendance system by setting virtual boundaries to allow the system to automatically record attendance when employees enter or exit predefined areas, ensuring accurate tracking of working hours. The main advantage is real-time location

verification, ensuring that employees are clocking in and out from the actual work location, reducing the risk of false or inaccurate attendance records. In addition, the notifications feature can also be added to the system to generate reminders in case the interns forget to clock in/out.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

Wan Fariza Wan Abdul Rahman: Conceptualization, Original draft preparation, Supervision, Writing, Reviewing and Editing. **Muhammad Syafiq Mohamad Bustamam**: Investigation, Writing - Original draft preparation, Data curation, and Visualization. **Yeffry Handoko Putra:** Verification of information.

DECLARATION OF GENERATIVE AI

The authors declare that no generative AI was used in the writing of the manuscript.

DATA AVAILABILITY STATEMENT

Data is available on request from the authors.

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