Journal of Applied Informatics Research Vol 01 No 02 (2025) pp. 22~31

Journal of Applied Informatics Research
Fakultas Vokasi, Kampus Unesa 1, Ketintang, Surabaya, Indonesia
Website: https://journal.unesa.ac.id/index.php/jair/ | E-mail: jair@unesa.ac.id

Development of a Web-Based PKL-Hub Management Information System Using the Waterfall Method

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ARTICLE INFORMATION

Article history:

Received December 28, 2025
Revised December 29, 2025
Accepted December 31, 2025

Keywords:

PKL;
Digital Logbook;
Web;
Waterfall;
Management Information Systems

ABSTRACT

The implementation of Praktik Kerja Lapangan (PKL) often encounters challenges in data management, including difficulties in locating partner companies and ineffective activity monitoring. This study aims to develop a web-based PKL management information system, named PKL-Hub, using the Waterfall method. The system was developed using HTML, CSS, JavaScript, PHP, and MySQL, and provides key features such as PKL location search, registration management, digital logbooks, activity monitoring, and partner-based assessment. Functional testing using the Black Box Testing method indicates that all system features operate according to the defined requirements. Therefore, PKL-Hub is able to improve administrative efficiency and coordination among students, faculty, and partner companies in PKL implementation.

1. INTRODUCTION

Praktik Kerja Lapangan (PKL) is an integral component of both vocational and academic higher education curricula, aiming to align student competencies with the needs of the workplace. Through PKL activities, students not only apply the theoretical knowledge gained in lectures but also develop professional skills, work ethics, and industry networks, which are crucial for future career readiness [1]. However, as the number of students and industry partners increases, PKL administration has become increasingly complex and presents various challenges for educational institutions.

One of the main challenges in PKL implementation is the lack of integrated data related to the search and selection of PKL locations. Students often conduct their own searches without centralized information regarding partner companies that have officially collaborated with the faculty, potentially leading to a mismatch between student competencies and the field of work at the PKL location [2]. Furthermore, the monitoring process for PKL activities, which still relies on physical logbooks, is considered ineffective, as supervisors experience limitations in evaluating and monitoring student activities in real time [3].

The use of web-based information technology is a relevant solution to address these issues. Web-based systems enable broader access to information without the constraints of space and time, and support centralized data synchronization between students, faculty, and partner companies [4]. Digitizing logbooks and assessment systems also contributes to increasing the efficiency of PKL management and maintaining data integrity and security through the use of a centralized database. A transparent system further ensures the objectivity of industry partners' assessments of student performance [5].

This research uses the Waterfall method as a software development framework. The Waterfall method was chosen because it has systematic and structured stages, from needs analysis and system design to implementation and testing. Therefore, it is suitable for developing PKL management systems with relatively stable and clearly defined functional requirements from the initial stage [6].

Based on these problems, this study aims to develop a web-based PKL Management Information System called PKL-Hub. This system is designed as a digital ecosystem that supports the process of finding PKL locations, managing registration, recording daily logbooks, monitoring activities, and assessing students by partner

companies. With PKL-Hub, it is hoped that the PKL administration process can run more structured, accountable, and efficient, and provide optimal benefits for students, faculty, and partner companies in improving the quality of graduates who are ready to face the world of work.

2. LITERATURE REVIEW

2.1. Previous Research

Several previous studies have discussed the development of web-based information systems to support the management of internships or field work practices (PKL). Ramada and Salim developed a web-based student internship application using the System Development Life Cycle (SDLC) method, with features such as online attendance, task management, and job recommendations that can help students manage internship data efficiently and in a structured manner. This system was developed using the Laravel framework and demonstrated results that meet the needs of modern internship operations [7].

Furthermore, Hasanah and Salim also studied a web-based internship monitoring application that utilized Laravel and the Waterfall method to improve the efficiency of accessing PKL grades and certificates for instructors and accelerate the process of creating well-integrated reports [8]. Another relevant study is the development of a web-based student internship monitoring information system that uses the SDLC approach and system development methods to provide attendance features, daily logbooks, and data management for monitoring internship participants in vocational high school settings [9].

In a similar context, Nugraha et al. designed and implemented a web-based internship information system using Laravel that simplifies internship registration and reporting and enables centralized data access from anywhere with an intuitive interface and database integration [10]. Furthermore, Santosa and Nurkhamid developed a web-based student internship information system that was tested against ISO 25010 software quality standards and demonstrated that the system effectively met the characteristics of usability, functional suitability, and performance efficiency [11].

Based on previous studies, it can be observed that most web-based PKL or internship systems focus on specific aspects such as attendance recording, activity monitoring, or registration management. While these systems have demonstrated improvements in administrative efficiency, they are generally developed as partial solutions addressing isolated processes. In contrast, PKL-Hub integrates PKL location search, registration, digital logbooks, monitoring, and partner-based assessment into a single centralized platform. This integration enables more comprehensive coordination among students, faculty, and partner companies, which differentiates PKL-Hub from earlier systems that primarily emphasized limited functional scopes.

2.2. Management Information System

Management Information System (MIS) is a computer-based system designed to collect, process, store, and distribute information to support decision-making, coordination, and control within an organization. MIS plays a crucial role in improving operational efficiency and resource management effectiveness by providing accurate, relevant, and timely information [12]. In the educational context, MIS is used to manage academic data, administration, and learning support activities in an integrated manner.

The implementation of MIS in the management of Field Work Practices (PKL) enables the integration of student, faculty, and partner company data into a single, centralized platform. This reduces data duplication, minimizes administrative errors, and increases transparency and accountability in the PKL process [13]. With the support of a web-based MIS, all stakeholders can access PKL information in real time according to their respective access rights.

2.3. Praktik Kerja Lapangan (PKL)

Praktik Kerja Lapangan (PKL) are an essential part of vocational and higher education curricula, aiming to bridge the gap between academic theory and industrial practice. PKL provides students with the opportunity to gain real-world work experience, develop professional skills, and understand the culture and demands of the work environment [14].

Several studies have shown that the success of PKL implementation is significantly influenced by a structured management system, from the registration process and student placement to activity monitoring and performance evaluation [15]. Without the support of a robust information system, the PKL process tends to face administrative challenges, delays in reporting, and difficulties in monitoring student activities by supervisors.

2.4. Web-Based Praktik Kerja Lapangan Information System

A web-based information system is a system that can be accessed via the internet using a web browser without requiring the installation of special software on the user's end. This system offers advantages in terms of accessibility, flexibility, and ease of maintenance [16]. In the context of internships (PKL), a web-based system allows students, supervisors, and partner companies to interact within a single, integrated digital platform.

Previous research has shown that a web-based PKL information system can improve data management efficiency, accelerate administrative processes, and support more effective monitoring of student activities than a manual system [17]. Furthermore, a web-based system also supports digital logbook recording, daily activity reporting, and objective and well-documented student performance assessments.

2.5. Waterfall Method

The Waterfall method is a sequential and systematic software development model, where each development stage must be completed before proceeding to the next. The main stages in the Waterfall method include requirements analysis, system design, implementation, testing, and maintenance [18].

This method is suitable for developing systems with clear and relatively stable functional requirements from the outset. In developing a PKL management information system, the Waterfall method is considered effective because the PKL business process flow is well-defined, such as registration, validation, monitoring, and reporting [19]. With this approach, each development stage can be systematically documented, facilitating system evaluation and testing.

2.6. System Development Technology

1. **HTML, CSS and JavaScript**

   HTML (HyperText Markup Language) is used to build the structure of web pages, while CSS (Cascading Style Sheets) functions to organize the appearance and layout of the user interface. JavaScript is used to improve the interactivity and responsiveness of web applications on the client side [20]. The combination of these three technologies allows the development of an intuitive and user-friendly PKL-Hub system interface.

2. **PHP and MySQL**

   PHP is a server-side scripting language widely used in developing dynamic web applications. PHP enables data processing, system logic management, and database integration [21]. MySQL is a relational database management system (RDBMS) used to store and manage structured data. The use of PHP and MySQL in the PKL-Hub system supports centralized and secure storage of student data, partner companies, logbooks, and assessment results.

2.7. Software Testing (Black Box Testing)

Black Box Testing is a software testing method that focuses on testing system functions without considering the internal code structure. This testing aims to ensure that each system function runs according to the established requirements and specifications [22]. In the PKL-Hub information system, Black Box Testing is used to test key features such as user authentication, PKL data management, logbook recording, monitoring, and student assessment.

3. RESEARCH METHODS

3.1. Type of Research

This research is a software engineering study using a development research approach. It focuses on the design and development of a web-based Field Work Practice (PKL) management information system, PKL-Hub, to support the process of finding PKL locations, managing administration, monitoring activities, and assessing students by partner companies.

3.2. System Development Methods

The system development method used in this research is the Waterfall method. The Waterfall method was chosen because it has structured and systematic stages, making it suitable for developing a PKL information system with relatively stable functional requirements that have been clearly defined from the initial stage. The stages of the Waterfall method in this research include needs analysis, system design, implementation, testing, and maintenance.

The Waterfall method is particularly suitable for PKL administrative systems because the business processes, such as registration, supervision, reporting, and assessment, are well-defined and relatively stable. This stability

allows system requirements to be clearly identified at the beginning of development, making a sequential development approach effective and minimizing the risk of major requirement changes during implementation.

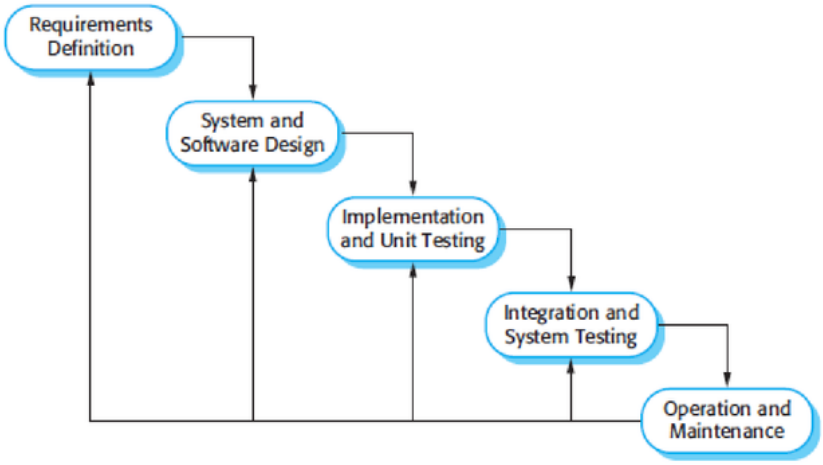

Figure 1. Waterfall Method

In accordance with the waterfall model mechanism, there are stages of software design, namely:

1. Requirements Definition

The needs analysis phase was conducted to identify the functional and non-functional requirements of the PKL-Hub system. This analysis involved identifying the system's actors: students, supervisors, and partner companies. The system's primary requirements included features for finding PKL locations, registering for PKL, completing a daily logbook, monitoring activities, communication between students and supervisors, and student assessment by partner companies.

2. System and Software Design

In the system design phase, the system architecture and database are designed using modeling diagrams such as Use Case Diagrams and Class Diagrams. Furthermore, the user interface is designed to ensure the system is easy to use and meets user needs.

3. Implementation and Unit Testing

The implementation phase involves translating the design results into a web-based application. The PKL-Hub system was developed using HTML, CSS, and JavaScript for the user interface, PHP as the server-side programming language, and MySQL as the database management system for centralized PKL data storage.

4. Integration and System Testing

System testing was conducted using the Black Box Testing method to ensure that each system function operates according to established requirements. Testing focused on user authentication, PKL data management, logbook completion, activity monitoring, and student assessment. Test results were used to assess the system's compliance with functional specifications.

5. Maintenance

The maintenance phase is carried out to ensure the PKL-Hub system continues to function properly after implementation. Maintenance includes bug fixing, system updates, and feature adjustments if user needs change.

4. RESULT AND DISCUSSION

This section presents the results of the development and testing of a web-based Field Work Practice Management Information System named PKL-Hub. The discussion focuses on the implementation of the system's main features and the results of functional testing conducted to assess the system's suitability to user needs. The results of this research were obtained through the application of the Waterfall development method described in the research methods section, so that each development stage was carried out systematically and structured. System evaluation was conducted to ensure that PKL-Hub is able to support the PKL management process effectively, efficiently, and integrated.

3.1. System Development Resource

The result of this research is a web-based Field Work Practice Management Information System called PKL-Hub. This system is designed to support the entire PKL implementation process, from finding a PKL location and registering students, monitoring activities, and final assessment by partner companies.

PKL-Hub was developed using a multi-user approach involving three main actors: students, supervising lecturers, and partner companies. Each actor has different access rights and functions according to their role in the PKL implementation. The implementation of the web-based system allows the entire PKL process to be conducted online and integrated within a single platform.

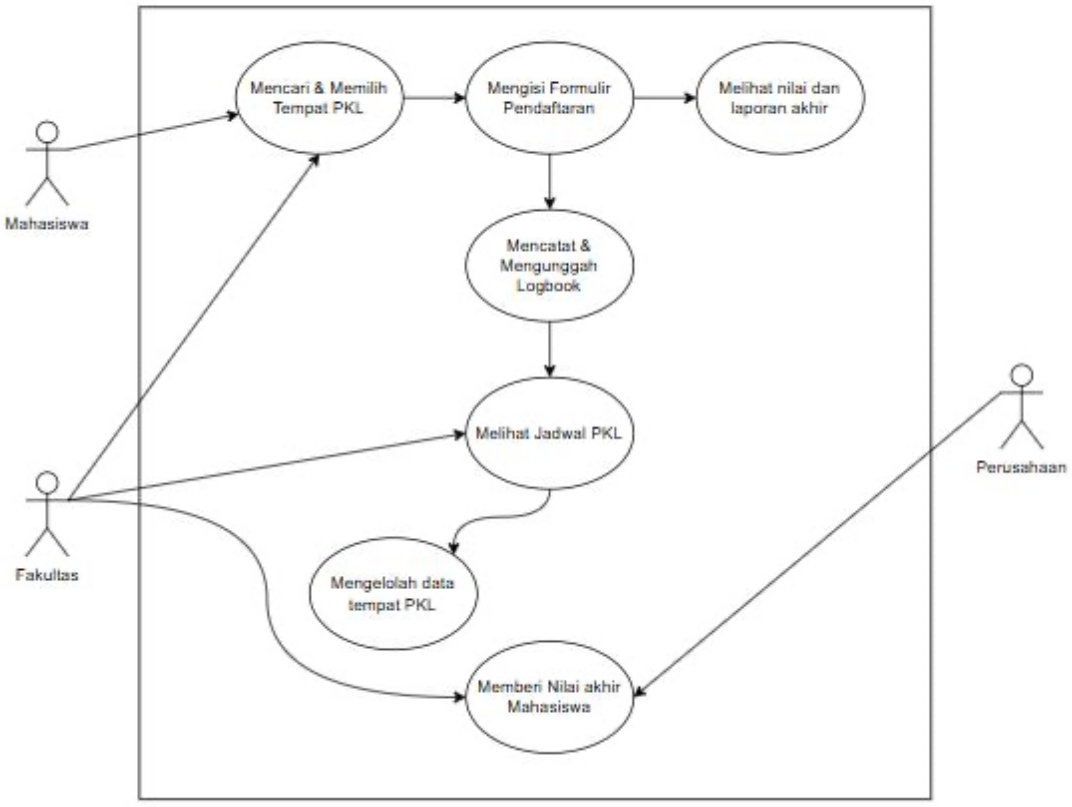

Figure 2. Use Case Diagram

Next, the PKL-Hub system design is visualized using use case diagrams to illustrate the relationships between actors and the main functions available within the system. These use case diagrams show how each actor interacts with the system according to their respective roles. The student actor has access to search for and select PKL locations, complete registration forms, record and upload activity logbooks, and view the PKL schedule and final report.

The faculty or supervising lecturer actor is responsible for managing PKL location data, monitoring student schedules and activities during the PKL, and supervising the overall PKL process. Meanwhile, partner companies have access to monitor student activities and provide final assessments to evaluate student performance during the PKL.

The use case diagram shown in Figure 2 demonstrates that all key processes in the PKL implementation have been integrated into a single web-based system. This integration enables effective information flow between students, faculty, and partner companies, allowing for more structured, transparent, and efficient PKL administration and monitoring.

3.2. Implementation of Main System Features

1. **User authentication features**

   The user authentication feature allows students, supervisors, and partner companies to access the system using their individual accounts. The system validates user data based on their roles, ensuring that each user can only access features appropriate to their authority. This authentication implementation aims to maintain data security and prevent unauthorized access to the system.

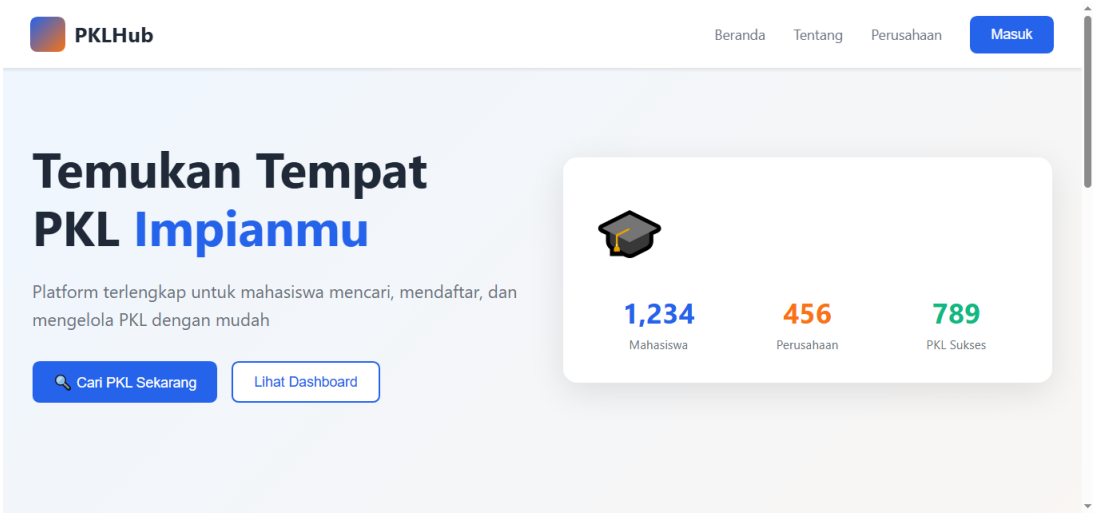

Figure 3. User Login Feature

The test results show that the authentication feature can work well, where users can successfully log into the system using valid credentials and are rejected when entering inappropriate data.

2. **Search and Registration Features for PKL Places**

The PKL-Hub system provides a PKL search feature that allows students to view a list of available partner companies. Information displayed includes company name, field of work, location, and student intake quota. Students can apply for PKL directly through the system without having to complete manual administrative processes.

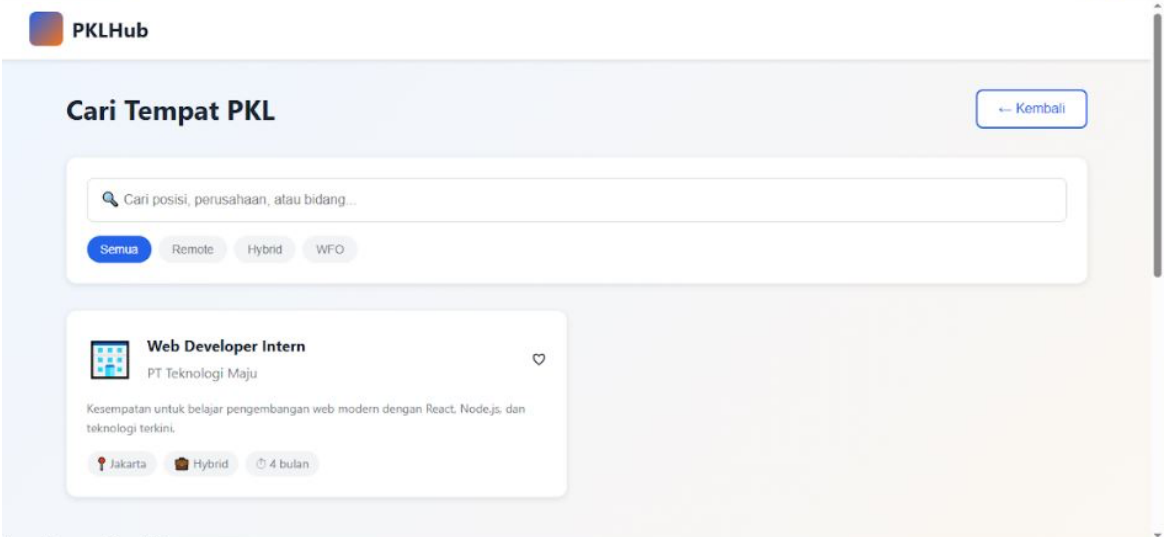

Figure 4. Search and Registration Features

The implementation of this feature helps students find PKL locations that suit their competencies and interests, while also making it easier for the faculty to monitor student registration status in real-time.

3. **Digital Logbook and attendance features**

The digital logbook feature allows students to record daily activities during their internship online. Each logbook entry is stored in a database and can be accessed by their supervisor for monitoring and evaluation purposes. The system also provides an attendance feature integrated with the activity logbook.

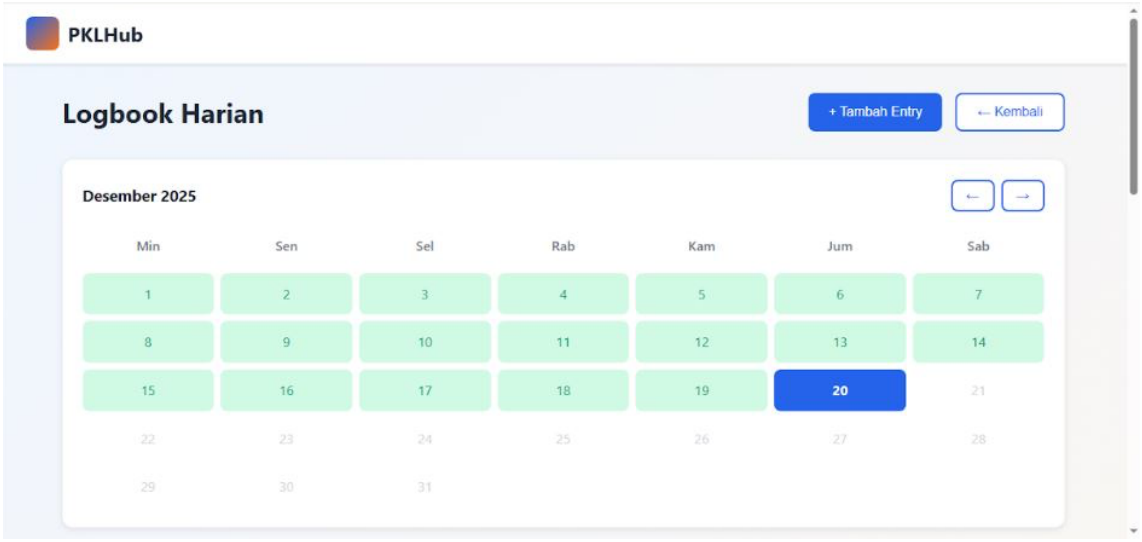

Figure 5. Logbook feature

The implementation results show that digitalization of logbooks can improve the regularity of activity recording and simplify the evaluation process compared to the use of physical logbooks which are prone to loss and late reporting.

4. **PKL Monitoring and assessment features**

PKL-Hub is equipped with a monitoring feature that allows supervisors and partner companies to monitor students' progress during their internships. Partner companies can provide a final assessment of student performance through the system based on predetermined criteria, such as discipline, responsibility, and work competency.

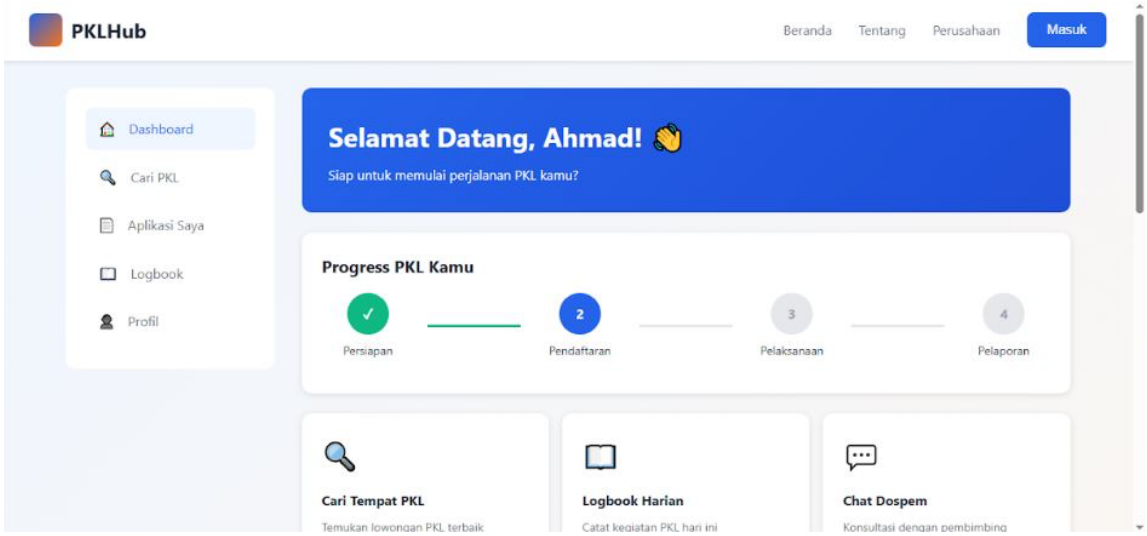

Figure 6. Monitoring feature

This feature supports transparency and objectivity of assessment because all data is stored centrally and well documented in the system.

3.3. Hasil Pengujian Sistem

System testing was conducted using the Black Box Testing method to ensure that all system functions operate according to established requirements. Testing focused on key features, including user authentication, PKL data management, activity logbooks, attendance, and monitoring and assessment.

Test results indicated that all key features of the PKL-Hub system functioned properly and met functional specifications. No errors were found that significantly disrupted system operation, thus declaring the system suitable for use in supporting PKL implementation.

Table 1. System Interface and Functionality Test Results

No	Tested Features	Test Scenario	Expected Results	Status (Valid/Not)
1	User Authentication	The user enters a valid username and password.	Displays an interactive map and distribution of school markers in Cianjur	Valid
2	User Authentication	The user enters invalid login details.	The system denies access and displays an error message	Valid
3	Registration	The student applies for internship registration with a partner company.	Registration data is stored and can be monitored by the faculty	Valid
4	Search for PKL Place	The student searches for a partner company.	The system displays a list of companies that meet the criteria	Valid
5	Daily Logbook	The student completes and saves an activity logbook.	Logbook data is stored and can be accessed by supervisors	Valid
6	PKL Attendance	The student records daily attendance.	Attendance data is recorded in the system	Valid
7	Monitoring PKL	The supervisor monitors student activity.	The system displays student logbook and attendance data	Valid
8	Assessment PKL	The partner company inputs the student's final grade.	Grades are stored and can be viewed by the faculty	Valid

3.4. Discussion

Based on the results of system development and testing, PKL-Hub has proven capable of addressing key issues in PKL management, which was previously handled manually. Digitizing the PKL process through a web-based system improves administrative efficiency, accelerates communication flows, and facilitates real-time monitoring of student activities.

These findings align with previous research, which found that implementing a web-based information system can improve the effectiveness of academic and educational administration. The difference between this study and previous research lies in the integration of PKL location search features, a digital logbook, monitoring, and assessment within a single, integrated platform that involves all PKL stakeholders.

Thus, PKL-Hub functions not only as an administrative system but also as a digital ecosystem that supports improving the quality of PKL implementation and student readiness for the workforce.

5. CONCLUSION

This research successfully developed a web-based Field Work Practice Management Information System (PKL-Hub) using the Waterfall development method. The system successfully integrated the processes of finding PKL locations, registering students, recording daily logbooks, attendance, monitoring activities, and final assessments by partner companies into one centralized platform.

Functional testing results using the Black Box Testing method demonstrated that all key system features performed according to established requirements and specifications. The implementation of PKL-Hub has been proven to improve administrative efficiency, facilitate real-time monitoring, and support transparency and objectivity in assessing student performance during the internship.

Therefore, the PKL-Hub system can be used as an effective digital solution to support the management of Field Work Practices in higher education institutions. Future development of the system can include the addition of student performance analytics features, automatic notification integration, and the development of a mobile-based application to enhance flexibility and user convenience.

Despite the positive results, this study has several limitations. The PKL-Hub system was developed as a web-based application and has not yet been optimized for mobile devices. In addition, advanced features such as learning analytics, automated notifications, and enhanced security mechanisms have not been fully implemented. Future research may focus on developing a mobile-based version of PKL-Hub, integrating student performance analytics, and strengthening system security to further support large-scale PKL management.

ACKNOWLEDGEMENTS

The authors would like to thank all parties who have supported and contributed to the implementation of this research. They also express their gratitude to the faculty and study program for providing facilities and permits for conducting the research. They also thank the partner companies and students who participated in the development and testing of the Field Work Practice Management Information System (PKL-Hub).

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