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Web-Based Internship Information System At Smk Nusantara 1 Kotabumi Using The Waterfall Method Approach

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Abstract

This study aims to design and develop a web-based internship information system for SMK Nusantara 1 to support the administration of students' industrial work practice. The existing PKL administration process still relies heavily on manual recording using paper forms and spreadsheets, which often leads to data duplication, document loss, and delays in report preparation. The proposed system was developed using the Waterfall model, which includes requirement analysis, system and database design using Unified Modeling Language (UML), implementation with PHP and MySQL, and functional testing through black-box methods. The system provides several main features, including user authentication, management of student and supervisor data, industry placement, daily activity input, supervisor assessment, final report submission, and PKL recap reporting. Testing results indicate that all functional requirements perform correctly, and users—including administrators, school supervisors, company supervisors, and students—reported that the system is easier to use compared to previous manual procedures. Overall, the system enhances transparency, reduces administrative errors, and improves the school's ability to monitor and evaluate internship activities effectively.

Keywords: Internship Information System, Vocational School, Web Application, PKL Management, Educational Information System.

INTRODUCTION

Vocational High Schools (*Vocational School* / SMK) require students to undertake Industrial Work Practice (Industrial Work Practice / PKL) as an essential component of competency-based learning. PKL is designed to equip students with real-world work experience aligned with industry needs, enabling the optimal development of both technical and professional competencies. Through PKL, students not only acquire technical skills but also develop soft skills such as communication, discipline, and responsibility (Cahya et al., 2017). However, in practice, many schools still manage PKL administration manually using paper forms, logbooks, or spreadsheets. This manual management approach introduces several challenges, including susceptibility to recording errors, difficulties in tracking student activity histories, and low data consistency and availability (Budianto et al., 2024).

At SMK Nusantara 1 Kotabumi, PKL administrative processes include student and supervisor registration, industrial placement requests, approval by school supervisors, monitoring of daily activity journals, evaluation by industry supervisors, and the preparation of final reports. These processes involve multiple stakeholders and require well-structured coordination. In the absence of an integrated information system, PKL administration often suffers from delays, unsynchronized data, and inefficient report generation (Damayanti et al., 2025).

Previous studies have demonstrated that web-based information systems can significantly improve the efficiency of PKL management as well as other academic activities. Systems designed with structured databases and role-based access control have been shown to provide higher data accuracy and facilitate better coordination among stakeholders. Furthermore, each school has unique workflow characteristics, indicating that information systems must be adapted to local business processes in order to be implemented effectively (Kaunang, 2018).

Based on these conditions, this study aims to design and implement a web-based PKL information system that is aligned with the workflow of SMK Nusantara 1, enabling all PKL processes—from

registration to final reporting—to be integrated into a single platform that is easily accessible to all relevant stakeholders.

The objectives of this study are as follows:

1. To analyze the PKL administrative business processes at SMK Nusantara 1.
2. To design a web-based PKL information system that meets the needs of administrators, school supervisors, company supervisors, and students.
3. To implement and evaluate the system so that it can be used as an effective tool for managing PKL activities in the school.

RESEARCH METHODS

This study adopted a system development approach using the Waterfall model, which is widely applied in structured information system development due to its sequential and systematic phases (Khairi, 2020). Data collection involved field observation, structured interviews, and document analysis, which are commonly employed methods in research related to PKL systems, inventory systems, and educational administrative services (Abdullah et al., 2023).

Requirement Analysis

This phase aimed to identify administrative problems and system requirements from all PKL stakeholders.

Field Observation

Observation refers to the direct examination of activities or behaviors of the research subjects (Sari & Khotimah, 2024). Field observations were conducted to review PKL administrative processes such as participant registration, industrial placement, daily activity recording, supervisor evaluation, and final report preparation. Manual processes relying on paper-based documents and spreadsheets resulted in redundancy, inefficiency, and potential data loss—issues that have also been reported in previous studies on PKL administration and inventory systems (Abdullah et al., 2023; Jannah et al., 2025).

Structured Interviews

Structured interviews were conducted with the Vice Principal for Curriculum Affairs, Head of Study Program, PKL Coordinator, company supervisors, school supervisors, and students. This method proved effective in capturing both functional and non-functional system requirements, as demonstrated in prior studies on loan and inventory information systems in village and district offices (Hidayat et al., 2023).

Document Analysis

The reviewed documents included PKL guidelines, registration forms, supervisor evaluation sheets, daily activity journals, and final reports. Document analysis is a critical technique for validating system requirements and is widely used in studies related to PKL systems and school administrative information systems.

System and Database Design

The design phase produced technical specifications using the Unified Modeling Language (UML), a modeling method widely applied in the development of educational and governmental information systems (Putra, 2020).

System Modeling Using UML

The UML diagrams utilized in this study included:

Use Case Diagram
Activity Diagram
Sequence Diagram
Class Diagram

The use of UML models enhanced clarity and consistency throughout the development process, as demonstrated in related research on PKL systems and inventory management applications (Kurnia et al., 2025).

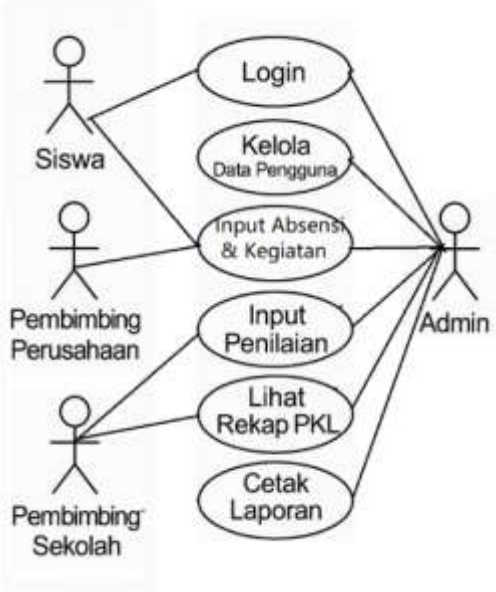

Figure 1. Use Case Diagram of the PKL Information System

Figure 1 illustrates the Use Case Diagram of the PKL Information System, which describes the interactions between four main actors—Students, Company Supervisors, School Supervisors, and Administrators—and the system.

All actors are required to perform authentication through the login process before accessing the system. Once authenticated, each actor is granted access to specific modules according to their respective roles and responsibilities.

Administrator

The administrator plays a central role in system management and reporting. The administrator is authorized to:

Manage user accounts;

Input and correct attendance and activity data;

iew PKL summaries and overall system statistics;

Generate official PKL reports.

Student

Students are responsible for recording their PKL activities. Their primary function is to: Record daily attendance and activity logs.

CompanySupervisor

Company supervisors are responsible for validating and assessing student performance during PKL. Their functions include:

Validating attendance and daily activity records;

Providing performance evaluations.

School Supervisor

School supervisors monitor student progress and ensure alignment with academic objectives. Their functions include:

Monitoring student activity records;

Providing evaluations;

Reviewing and summarizing final PKL reports.

This role mapping ensures a clear separation of responsibilities within the system. Students focus on entering activity data, supervisors validate and evaluate the activities, and administrators

oversee data management and reporting. Such separation enhances accountability, data accuracy, and workflow efficiency within PKL administration.

Database Design

The database was designed using an Entity Relationship Diagram (ERD) to represent the structure and relationships among system data entities. The key entities include students, school supervisors, company supervisors, industrial placements, daily activities, assessments, and final reports.

The use of ERD ensures that data management is structured, relational, and normalized, which is essential for academic administrative systems that require consistency, integrity, and traceability of records. This design approach supports efficient data retrieval, minimizes redundancy, and facilitates reliable reporting, as recommended in previous studies on PKL systems and academic information systems (Kurnia et al., 2025).

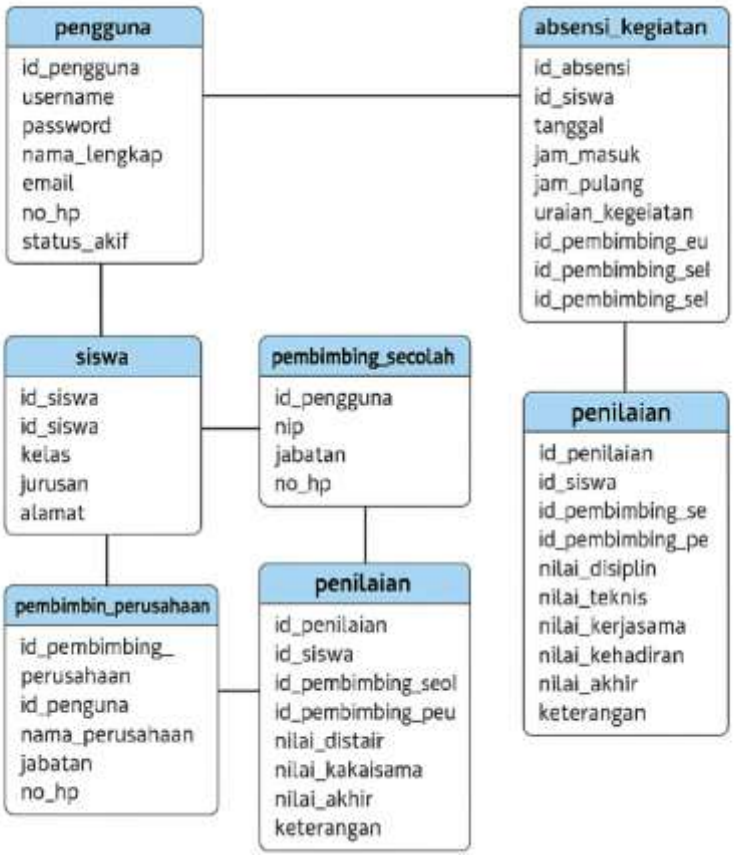

Figure 2. Entity Relationship Diagram (ERD) of the PKL Information System

The ERD illustrates how key entities are interconnected to support PKL administration. The user entity serves as the central authentication point for all roles: administrator, student, school supervisor, and company supervisor.

The student, school supervisor, and company supervisor entities are linked to the user entity through foreign keys to store role-specific identity details.

The PKL operational process is represented through daily_activity, which records attendance and daily assignments, and assessment, which stores evaluation data provided by school supervisors and companies.

This relationship ensures that each activity and assessment is correctly attributed to the authorized actor and PKL participant. Overall, the ERD enables structured integration of PKL data, supporting accurate recording, monitoring, and evaluation. The database is implemented using MySQL (Raharjo et al., 2022).

RESULTS AND DISCUSSION

Results

Implementation

The system was implemented based on the specifications produced during the design phase. All system functionalities were developed using PHP with the Model–View–Controller (MVC) approach to ensure a clear separation between application logic, user interface, and data processing. HTML5 was used to define the structure of the web interface, CSS3 was applied for layout styling and visual consistency, and JavaScript/AJAX was utilized to enhance system interactivity and responsiveness.

MySQL served as the database engine for storing all transactional and master data, while XAMPP or Laragon was used as the local development environment to facilitate testing and debugging during the development process. The implementation of Role-Based Access Control (RBAC) ensured that each user role administrator, student, school supervisor, and company supervisor could only access features relevant to their respective responsibilities. This mechanism enhanced data security and prevented unauthorized access to sensitive information.

The system architecture adopts a three-tier model, consisting of:

Client Layer, represented by web browsers used by all actors to access the system;

Application Layer, implemented as a PHP–CodeIgniter web server responsible for processing business logic and handling user requests;

Database Layer, implemented using MySQL to manage persistent data storage.

These layers communicate through HTTP requests and database queries, enabling efficient data exchange and real-time processing. This architectural design supports system scalability, maintainability, and reliability, making it suitable for long-term use in managing PKL administration activities.

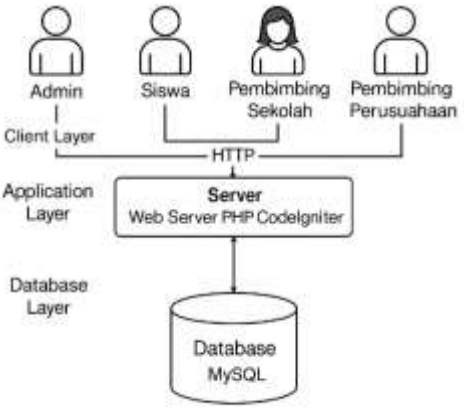

Figure 3. System Architecture

User Interface Implementation → Login Module

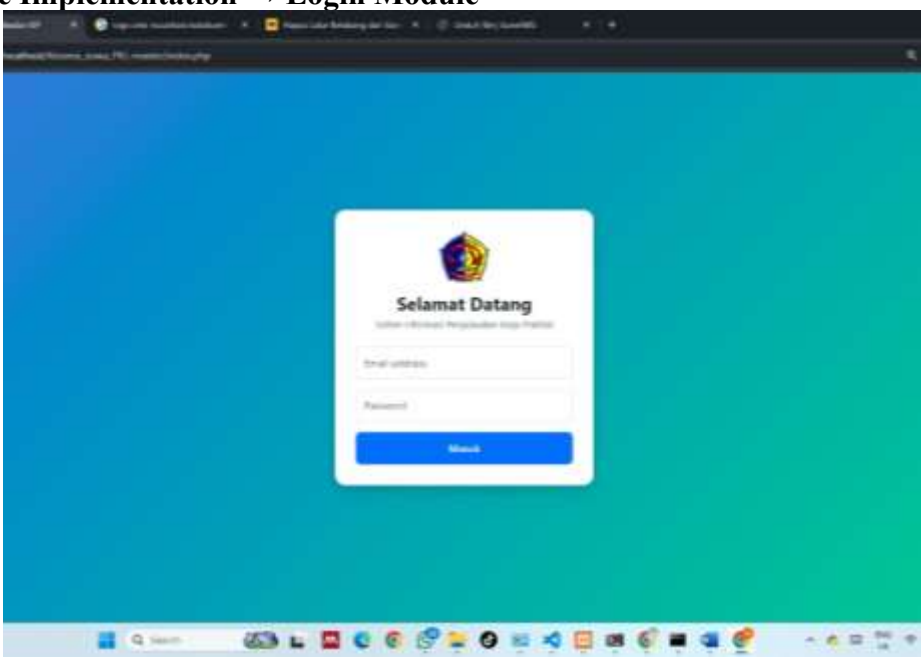

Figure 4. PKL Information System Login Interface

The login interface shown in Figure 4 provides an authentication mechanism for all user roles, including students, school supervisors, company supervisors, and administrators. The interface is designed with a clean and responsive layout to ensure accessibility across various devices.

Dashboard Structure and Navigation

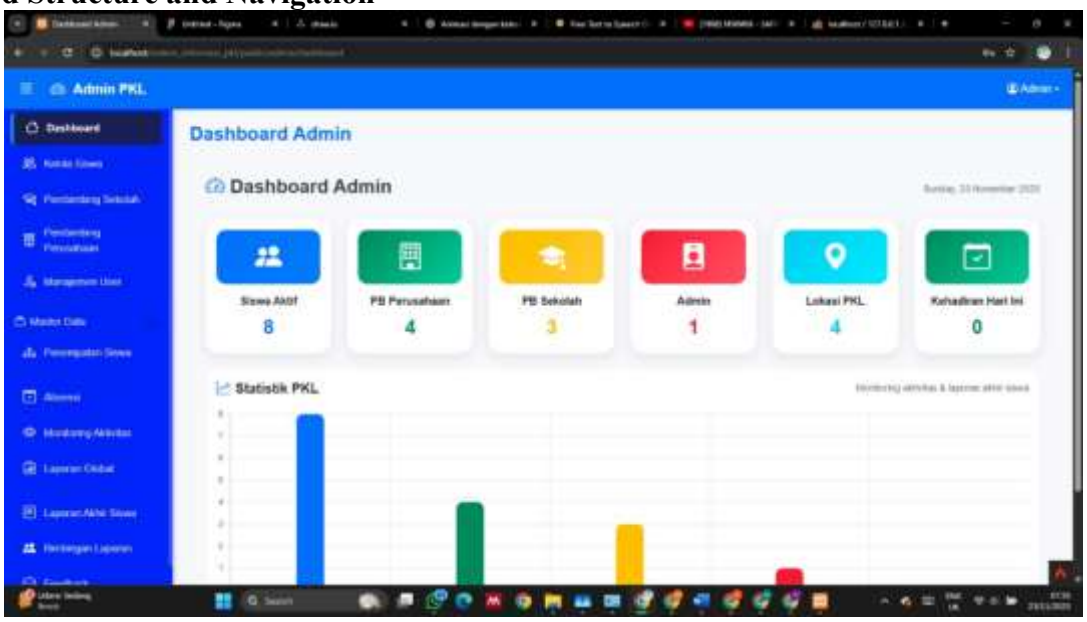

Figure 5. Admin Dashboard Interface

Figure 5 presents the administrator dashboard, which serves as the main navigation hub for managing students, supervisors, companies, internship placements, and reports. The dashboard utilizes a sidebar menu to enhance usability and enable quick access to core modules.

Main Module Implementation → Placement Module

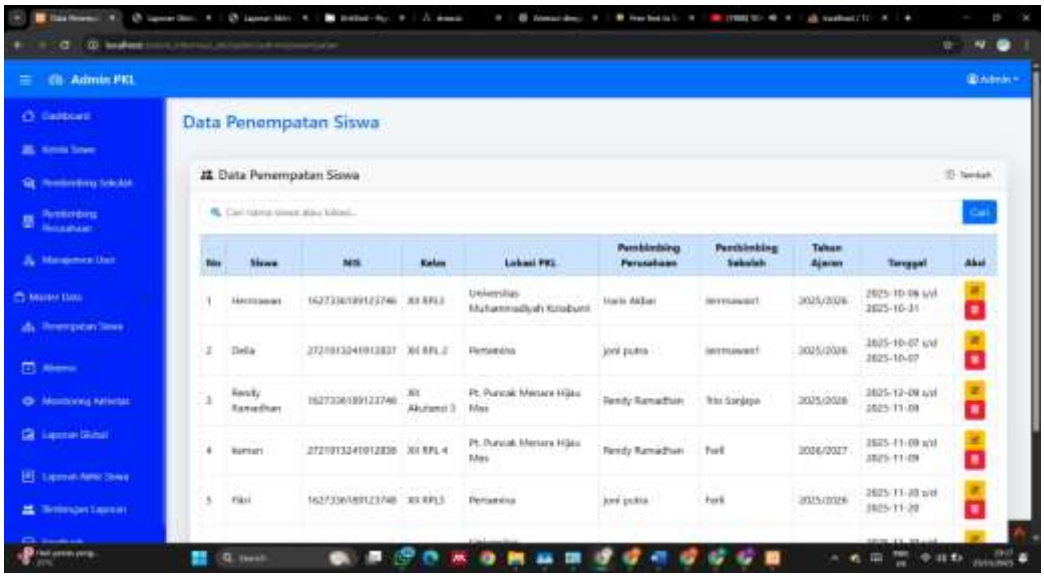

Figure 6. Student Internship Placement Module Interface

As shown in Figure 6, the Student Placement module allows administrators to view and manage internship allocations. Each record displays the student's identity, class, internship company, assigned supervisor, academic year, and internship duration.

Main Module Implementation → Placement Module

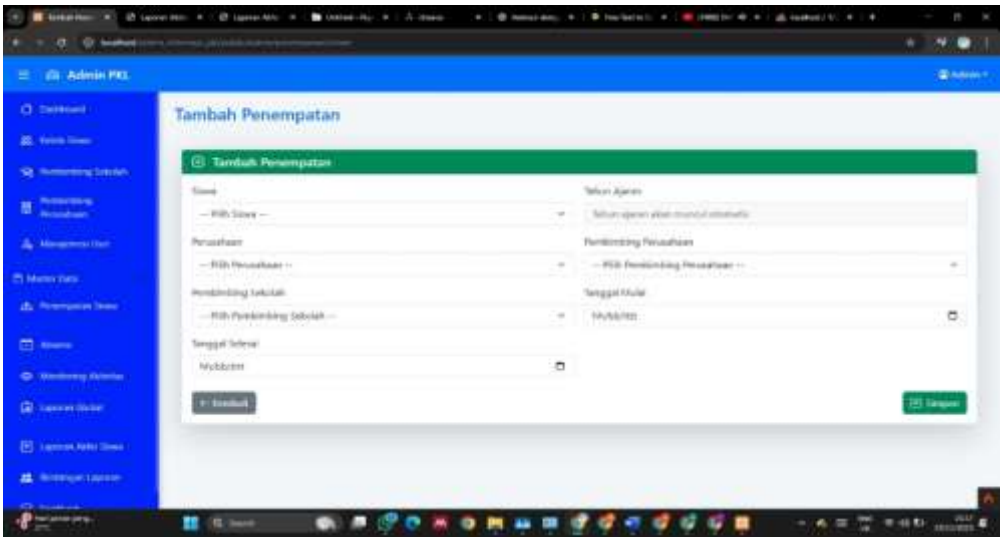

Figure 7. Add Internship Placement Form

The Add Placement Form (Figure 7) is used by administrators to assign students to companies and supervisors. This form includes dropdown selection fields to minimize human error and ensure that placement data remain consistent across the entire system.

Discussion

The system implementation comprises several integrated modules. The Data Management module enables administrators to perform CRUD (Create, Read, Update, Delete) operations on student data, supervisor data, company data, and internship placement records. The Internship Placement module manages the assignment of students to companies along with their designated supervisors. The Daily Activity module allows students to record their attendance and daily task descriptions, which are

subsequently verified by both company and school supervisors. The Assessment module records supervisor evaluations, while the PKL Recap module summarizes placement data, attendance, and assessment results for reporting purposes.

a. Functional Testing

Functional testing was conducted using the Black Box Testing method to verify whether each module produced the expected outputs. The testing scenarios included login validation, data management operations, placement processing, daily activity submission, assessment entry, and retrieval of summary reports.

Table 1. Black Box Testing Summary

Testing Scenario	Input	Expected Output	Actual Output	Result
Successful Login	Valid credentials	Redirected to dashboard	Redirected to dashboard	Passed
Failed Login	Incorrect password	Error message	Error message	Passed
Add Student Data	Complete form	Data saved	Data saved	Passed
Submit Attendance	Valid date & activity	Data saved	Data saved	Passed

All tested functions produced results consistent with expectations. The Daily Activity module required the highest number of test cases because it is the most frequently used module. Overall, the system operated reliably, and no functional errors were identified during testing.

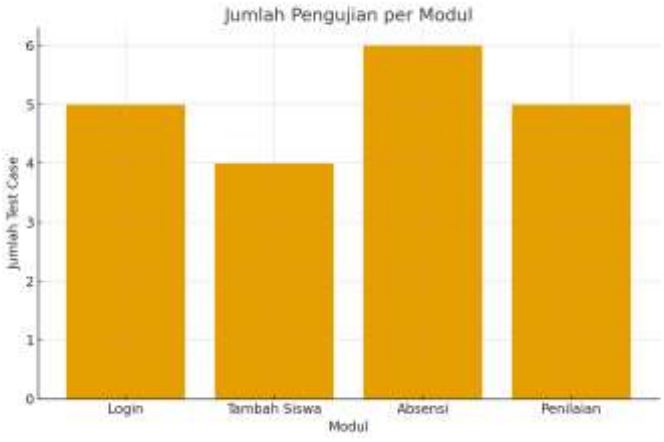

Figure 8. Distribution of Test Cases by Module

Usability Evaluation

Usability evaluation was conducted to measure ease of use, interface clarity, responsiveness, data access speed, feature comprehensibility, and overall user satisfaction. The evaluation involved 20 respondents, consisting of 10 students, 4 school supervisors, 3 company supervisors, and 3 administrators. Respondents completed a questionnaire using a five-point Likert scale.

Table 2. Usability Evaluation Results.

Aspect	Score	Category
Ease of Use	4.45	Very Good
Interface Clarity	4.30	Good
Data Access Speed	4.10	Good
Responsiveness	4.25	Good
Feature Comprehension	4.40	Very Good
Overall Satisfaction	4.55	Very Good

The results indicate high usability performance. Ease of use received the highest rating (4.45), confirming that users are able to operate the system without difficulty. User satisfaction (4.55) was also very high, indicating that the system significantly improves PKL administrative processes compared to previous manual procedures. The variation in average scores across different aspects further demonstrates consistent user acceptance of the system's interface, responsiveness, and clarity. Overall, the system meets expectations in terms of usability and effectively supports efficient PKL management through accurate data recording, simplified monitoring, and convenient reporting.

Interpretation and Discussion

The implementation results confirm that the system successfully aligns with its intended objectives. The user authentication, activity logging, data management, and supervisor assessment modules functioned in accordance with the predefined requirements. The ERD structure ensures proper data integrity by linking all entities—students, supervisors, companies, activities, and assessments through well-defined relationships. This design strengthens data consistency and enhances monitoring accuracy.

Usability findings further reinforce that the system not only operates correctly but is also well accepted by its users. High satisfaction scores indicate that the system reduces administrative workload, eliminates document duplication issues, and minimizes reporting delays. These findings are consistent with previous studies highlighting the effectiveness of web-based information systems in improving accessibility and accuracy of internship data when supported by structured databases and role-based access control.

This research aligns with prior studies showing that the development of monitoring and management information systems for Industrial Work Practice (PKL) is an effective solution to address various implementation challenges, both in higher education and vocational high schools. The developed systems have been proven to enhance monitoring effectiveness, reporting honesty, ease of data management, and support evaluation and assessment processes, including under constrained conditions such as during the pandemic. The application of system development methodologies such as Waterfall and SDLC, along with Object-Oriented Analysis and Design (OOAD) using UML modeling, resulted in a system that is valid, functional, and received very positive evaluations from both users and experts. Therefore, the PKL information system serves not only as an administrative support tool but also contributes significantly to improving the overall quality of PKL management and provides a foundation for the development of similar systems in the future (Febriani et al., 2022; Muthahhari et al., 2021; Nurdiana et al., 2024).

CONCLUSIONS

The results of this study indicate that the development of a web-based internship (PKL) information system for SMK Nusantara 1 successfully addressed the core problems identified in the previous manual PKL administrative processes. The system integrates data management for students, school supervisors, company supervisors, industrial placements, daily activity reporting, assessments, and final report submission into a unified platform that is more accessible and easier to manage.

The implemented features functioned properly based on functional testing results, while the usability evaluation confirmed that users perceived the system as easy to operate, responsive, and supportive of PKL administrative activities. Overall, the system provides an effective solution for improving data accuracy, transparency, and efficiency in monitoring and evaluating PKL activities. Furthermore, the system can serve as a reliable administrative tool for future PKL management within the school.

For future development, the system may be enhanced by integrating automated notification features, online assessment analytics, and mobile-based access to further improve usability and scalability. These enhancements are expected to strengthen the system's role in supporting digital transformation in vocational education administration.

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