Development of an Integrated Portal System for KSDAE Unit Website Management Using the Agile Method

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ABSTRACT

The Natural Resources and Ecosystem Conservation Unit (KSDAE) still faces challenges in website management due to the lack of integration between work units, resulting in inconsistent information management and ineffective public information dissemination. This study aims to develop a web-based integrated portal system to support centralized information management within KSDAE units. The system integrates several features, including news publication, article management, event information, conservation data, and licensing reports. The development process applied the Agile methodology to support iterative and adaptive system development based on user requirements. The system was implemented using React.js, TypeScript, HTML, CSS, and SQLite to create a responsive and interactive interface. System testing was conducted using the Black Box Testing method. The testing results showed that all 8 functional test cases were successfully completed, achieving a 100% success rate in validating the core system functionalities according to the specified requirements. The developed system improves information integration, supports centralized content management, and enhances publication workflows across KSDAE work units.

I. INTRODUCTION

Several previous studies have developed web-based information systems using the Agile method, including inventory management systems, public complaint systems, library information systems, and financial reporting systems [1]–[5]. However, these studies mainly focus on specific organizational functions and do not address the integration of website management across multiple organizational units within a centralized platform. Furthermore, existing systems generally lack integrated content verification and publication workflows that are essential for maintaining information consistency across distributed work units.

The novelty of this research lies in the integration of content management, conservation data publication, and verification workflows into a single web-based portal system specifically designed for KSDAE operational environments.

A. Literature Review

An information system is a combination of related components that work together to process and manage data in order to support organizational activities and decision-making processes [1]. In the KSDAE environment, the use of web-based information systems is important to improve coordination, information distribution, and centralized data management among work units [2]. Therefore, the development of an integrated portal system is needed to support more effective and structured website management [3].

This study uses React.js to build an interactive and component-based user interface [6]. TypeScript was implemented to improve code consistency and reduce errors during development [7]. HTML and CSS were used to create responsive page layouts and interface designs. SQLite was selected as the database because it is lightweight and easy to implement without requiring a dedicated server [8]. In the system design stage, UML diagrams such as Use Case Diagrams and ERD were created using Draw.io to describe system workflows and database relationships [9]. The overall system development process applied the Agile method because it supports iterative development and allows adjustments based on user requirements during implementation [10].

II. METHOD

This study was conducted through three Agile development iterations. The first iteration focused on requirement analysis and system planning, including observations and interviews with KSDAE personnel. The second iteration involved system design and implementation of core functionalities such as user management, content publication, content verification, and report management modules. The third iteration focused on system testing, evaluation, and refinement based on user feedback.

The stakeholders involved in the development process consisted of Super Admins, Regional Office Administrators, National Park Administrators, and Public Users. Super Admins were responsible for user management and content verification, while Regional Office and National Park Administrators managed unit-specific information and publication content. Public Users accessed published information through the portal.

The functional requirements identified during the requirement analysis stage included user authentication, role-based access control, unit profile management, content publication, content verification, report generation, and public information access. The non-functional requirements included system responsiveness, usability, data integrity, maintainability, and compatibility across modern web browsers.

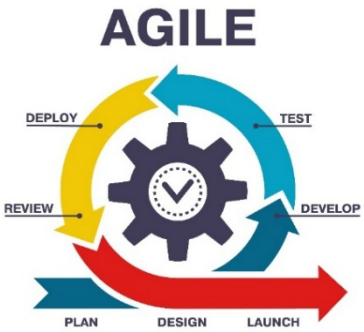

Fig. 1. Agile Development Process

A. Agile Method Stages

The system development stages in this study include:

- Planning:
  Identification of problems related to KSDAE website integration and requirement gathering through observations and interviews regarding data coordination workflows.
- Design:
  System architecture modeling using UML diagrams (Use Case and ERD), focusing on access rights management and database centralization.
- Implementation:
  Development of the portal using React.js, TypeScript, and SQLite, including dashboard modules, content management, and verification features.
- Testing:
  Verification of interface functionality and system feature logic using the Black Box Testing method.
- Review and Deployment:
  Final adjustments based on user feedback from KSDAE units until the system is functionally ready for operation.

B. Data Collection Method

Data collection in this study was carried out through the following methods:

- Observation: Direct observation of information management workflows and data publication processes in KSDAE work units, which are currently managed separately
- Interview: Conducting structured interviews with information management personnel within the Ministry of Forestry to identify the functional and non-functional requirements of the system.
- Documentation Study: Reviewing internal documents, organizational structures, and reporting archives from various regional offices and national parks to determine portal content standardization.
- Literature Study: Examining scientific literature, journals, and technical references related to web-based application development, the React.js framework, and Agile method implementation.

C. System Testing Technique

The integrated portal system was tested using the Black Box Testing method with the equivalence partitioning technique. This method focuses on validating system functions based on input and output variations without examining the internal structure of the program code. The purpose is to identify errors in the main features and ensure that the system operates according to the functional requirements established for KSDAE units. The equivalence partitioning technique was applied by dividing test data into several classes to ensure testing efficiency while maintaining optimal functional coverage. Through this method, the portal development process can be carried out in a structured and flexible manner in response to changing requirements. In addition, this approach ensures that the system is capable of improving information management efficiency and data integration among work units within the ministry.

Table 1. Black Box Test Cases

No	Testcase	Type	Description	Expected	Result
1	Public Access	POS	Log in using Super Admin, Regional Office, or National Park accounts	Successfully access the dashboard according to user access rights	Pass
2	Failed Login	NEG	Login using Super Admin, Regional Office, or National Park accounts	System rejects invalid credentials and displays warning message	Pass
3	Unit Data Management	POS	Add or update Regional Office/National Park unit profile data	Data is successfully updated in the database	Pass
4	Content Verification	POS	Central admin verifies publication submissions from regional units	Content status changes to "Verified"	Pass
5	Portal Publication	POS	Display verified data on the public portal page	Content appears in real-time on the main portal	Pass
6	User Management	POS	Super Admin creates a new account for Regional Office operators	New account is successfully created and can be used	Pass
7	Report Generation	POS	Download recap reports from multiple work units	Report files are successfully downloaded with accurate data	Pass
8	Empty Data Input	NEG	Save data without completing mandatory fields	The system rejects the submission and displays a warning message	Pass

III. RESULTS AND DISCUSSION

A. Results

The development process produced an Integrated Portal System tailored to the operational requirements of information management within KSDAE work units under the Ministry of Forestry. During the implementation stage, the system was developed using the React.js library with TypeScript and SQLite database support. This approach enables the separation between application logic and user interface components, making the system more structured, scalable, and maintainable. The implementation process was carried out gradually, starting from the main dashboard module, regional office content management, Digital Arboretum features, and licensing report management modules. The resulting system provides three primary user levels, namely Super Admin, Regional Office/National Park Admin, and public users. The Super Admin has authority to verify all published content and manage user accounts, while Regional Office/National Park Admins are responsible for managing information related to their respective units. Public users are able to access public information and species data openly through the portal system:

To illustrate the implementation results, several main interface displays are presented to represent the core functionalities of the system. At this stage, the researchers successfully implemented the system design based on the analysis conducted in the previous stages.

Fig. 2. Main Homepage Interface (Public User)

Fig. 2 shows the public homepage interface containing general information related to the latest KSDAE news, conservation education articles, and navigation to the Digital Arboretum feature. This page functions as the primary medium for information dissemination and transparent delivery of flora and fauna data to the public.

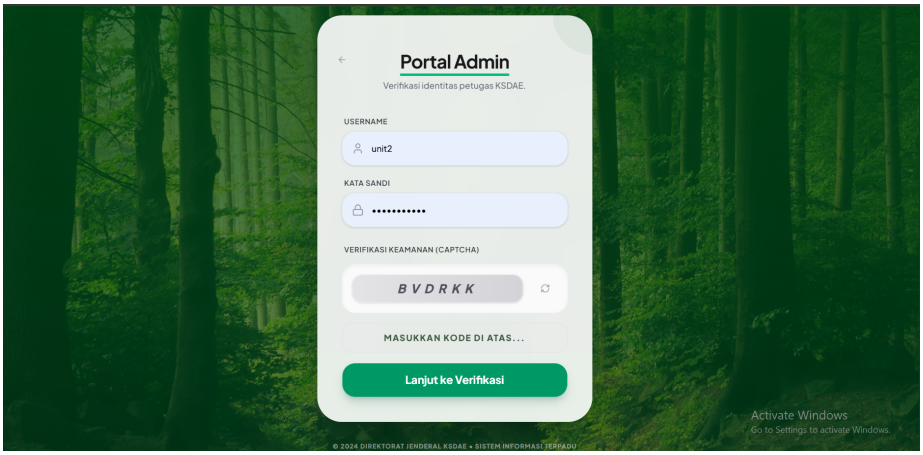

Fig. 3. Login Page Interface

The login page functions as an authentication gateway to restrict user access rights based on role-based access control. Super Admins, Regional Office Admins, and National Park Admins are required to enter valid username and password credentials to ensure data security and content management authorization within the KSDAE environment. Based on the results of test cases 1 and 2, the system automatically grants access for valid login data and displays warning messages when incorrect credentials are entered.

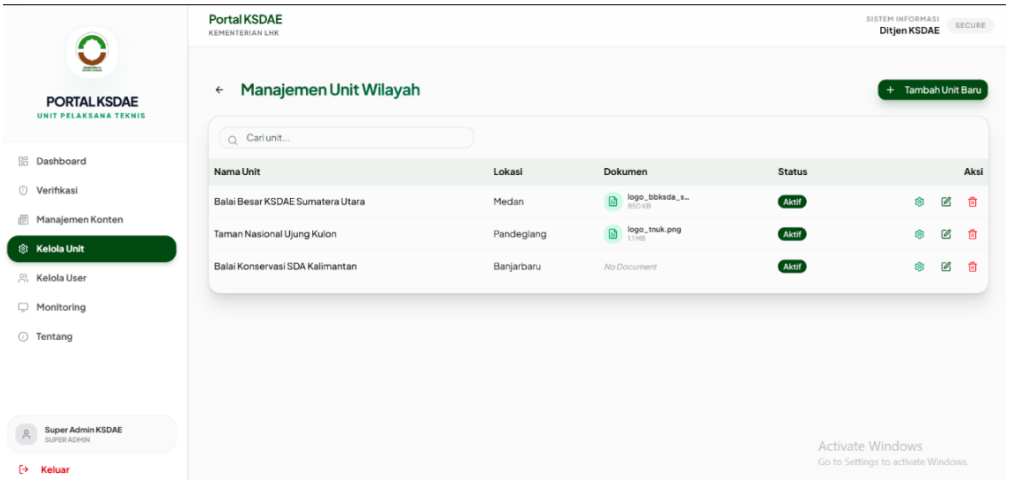

Fig. 4. Unit Data Management Page

Fig. 4 implements a dynamic table that integrates unit information, location data, documents, and functional status in real-time. This feature supports CRUD (Create, Read, Update, Delete) operations to optimize data management efficiency and maintain information integrity among Regional Offices and National Parks within a single integrated platform.

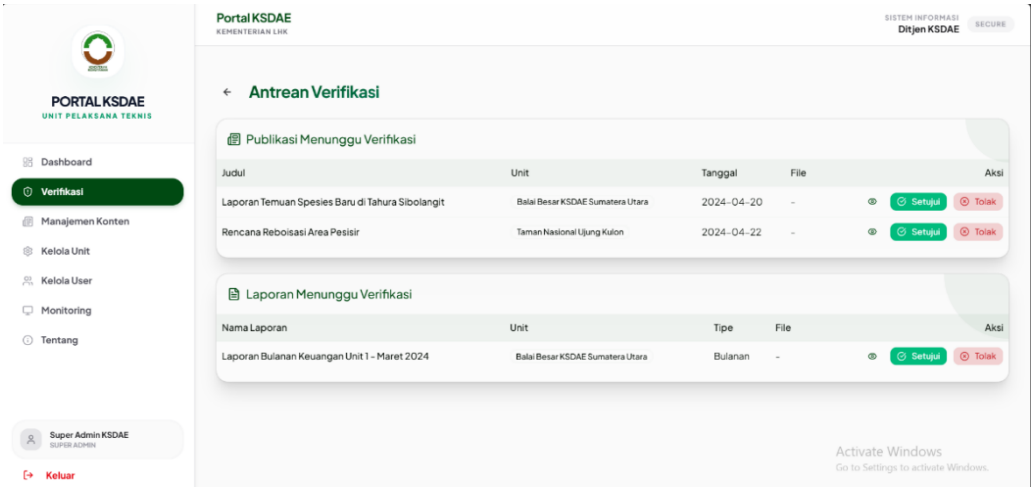

Fig. 5. Content Verification and Management Page

This process functions as a data quality control mechanism for validating content before public dissemination. Through the classification of information publications and administrative reports, the Super Admin applies an approval gate to ensure data integrity and minimize input errors from regional work units. This mechanism ensures that all published information complies with established operational standards and technical validity requirements.

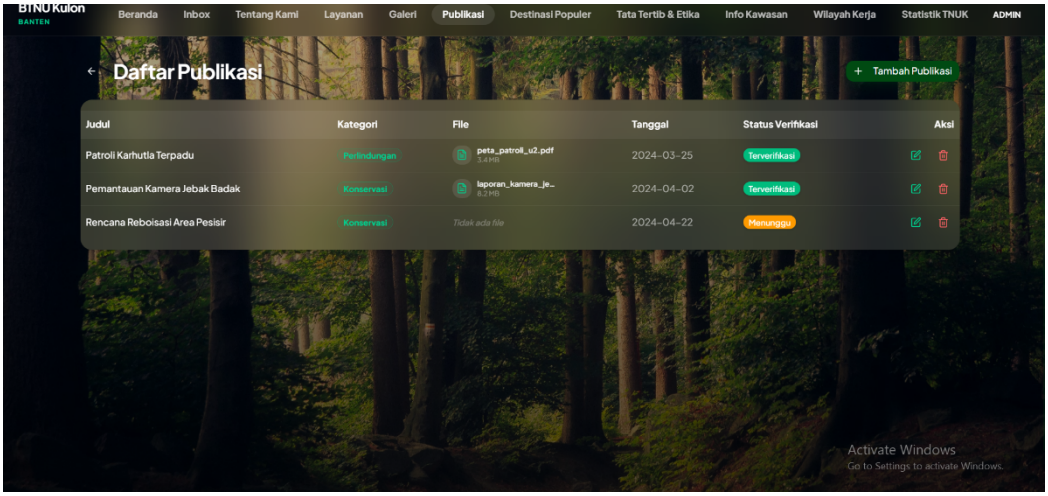

Fig. 6. National Park Content Verification Page

In the information management process, unit administrators are able to publish content independently through the system. Fig. 6 shows the BKSDAE UTP Publication List page, where administrators can add, edit, and monitor the verification status of uploaded articles, news, images, events, and informational content before validation by the Super Admin. This mechanism replaces conventional manual reporting methods through formal correspondence, allowing conservation information dissemination to become faster, more structured, and capable of ensuring data validity before being displayed on the main portal.

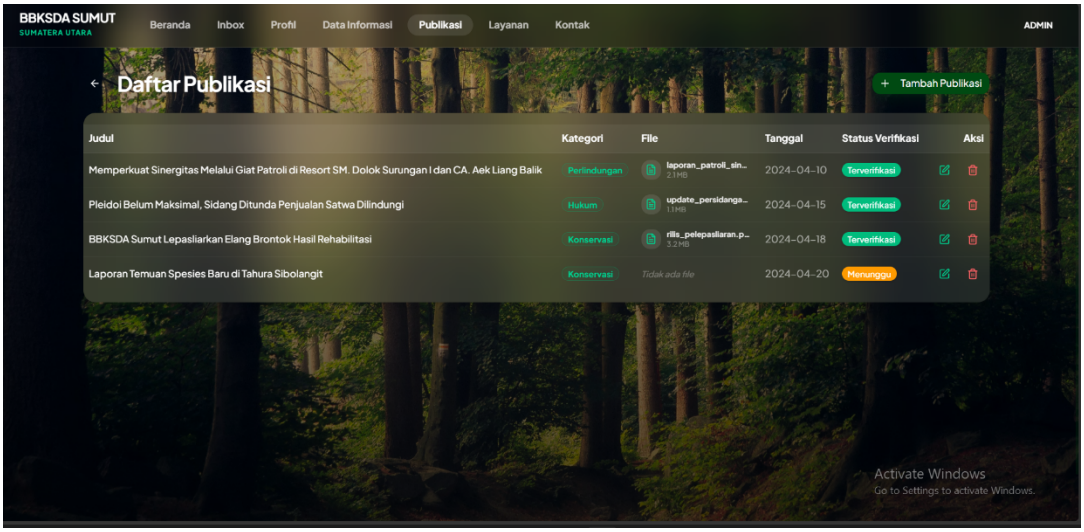

Fig. 7. Regional Office Content Verification Page

In the information management process, Regional Office administrators are able to publish content independently through the system. Fig. 7 shows the BBKSDA North Sumatra Publication List page, where administrators can add, edit, and monitor the verification status of uploaded articles, news, images, and events before validation by the Super Admin. This mechanism replaces conventional manual reporting methods through formal correspondence, enabling conservation information dissemination to become faster, more structured, and capable of ensuring data validity before being displayed on the main portal.

Table 2. Summary of Black Box Testing Results

No	Test Scenario	Result
1	Login Authentication	Pass
2	Dashboard Access	Pass
3	Content Publication Management	Pass
4	Content Verification Process	Pass
5	Unit Data Management	Pass
6	Report Generation	Pass
7	File Download Function	Pass
8	Input Validation	Pass
	Success Rate	100%

B. Discussion

The development of the web-based KSDAE Integrated Portal System demonstrates that information technology can effectively address website management problems that were previously handled separately across Regional Offices and National Parks. Before implementation, information publication and reporting activities were conducted independently by each work unit, resulting in inconsistent information, data redundancy, and difficulties in monitoring publication activities.

After the implementation of the integrated portal system, all content management and publication processes are centralized within a single platform. Regional Office and National Park administrators can manage content independently, while the Super Admin performs verification and approval before publication. This mechanism improves coordination among work units and ensures information consistency and validity.

Based on the Black Box Testing results, all eight test scenarios were successfully executed, resulting in a 100% success rate. The tested functionalities included login authentication, content management, publication verification, report generation, file downloads, and input validation. These results indicate that the system operates according to the specified functional requirements.

Compared to the previous manual workflow, the proposed system provides a more structured publication and verification process. Content submissions, verification procedures, and publication activities can now be performed digitally and monitored in real time. This improvement reduces administrative workload, minimizes data redundancy, and accelerates information dissemination.

Furthermore, the system improves content management efficiency, enhances transparency of conservation information, and provides better accessibility to flora and fauna data. The Agile development approach also supported system adaptability through iterative development and continuous user feedback.

Overall, the developed KSDAE Integrated Portal System improves the efficiency, consistency, transparency, and reliability of information management within the Ministry of Forestry environment and provides a foundation for future digital service development.

IV. CONCLUSION

Based on the results of the research and discussion, it can be concluded that the web-based KSDAE Integrated Portal System successfully addresses website management problems that were previously handled separately across Regional Offices and National Parks. The developed system integrates content management, flora and fauna data, and licensing reports into a centralized platform, thereby improving information consistency, operational efficiency, and publication effectiveness within the Ministry of Forestry environment. Based on the Black Box Testing evaluation, all eight test scenarios were successfully executed with a 100% success rate, indicating that the system functions reliably according to the specified requirements. The implementation of role-based access control and content verification mechanisms also contributes to maintaining information validity and improving transparency in information dissemination. Therefore, the developed system provides an effective solution for supporting digital information management within KSDAE work units.

Future development of the system may include the implementation of cloud-based databases, mobile platform integration, and real-time monitoring features to further improve scalability and accessibility of KSDAE information services [12].

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