Web-Based Monitoring Information System for Crab Cultivation at BBPBAP Jepara

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Abstract— Crab aquaculture has become one of the key sectors in the development of aquaculture in Indonesia, particularly in coastal areas such as Jepara. The Brackishwater Aquaculture Development Center (BBPBAP) Jepara plays a strategic role in advancing aquaculture technology and practices. However, field monitoring activities are still often carried out manually using paper-based records or simple spreadsheets. This practice not only complicates data collection and processing but also increases the risk of data loss and delays in decision-making. This study aims to design and implement a web-based Crab Aquaculture Monitoring Information System at BBPBAP Jepara, utilizing Laravel as the backend framework, Tailwind CSS for a modern and responsive user interface, and MySQL as the database management system. The system is designed to simplify data recording, management, and visualization, thereby supporting BBPBAP Jepara staff and management in conducting comprehensive monitoring. The system development follows the Waterfall methodology, consisting of sequential stages including requirements analysis, system design, implementation, testing, and maintenance. The testing and evaluation results show that the system improves recording efficiency, monitoring accuracy, and user coordination. Features such as reporting, interactive charts, role-based access control, and data export provide added value for analysis and decision-making. Thus, the system makes a tangible contribution to supporting operational transparency and enhancing data management in aquaculture at BBPBAP Jepara.

Keywords— sistem informasi, kepiting, laravel, tailwind CSS, waterfall, digitalisasi perikanan.

I. INTRODUCTION

The application of information technology (IT) covers personal, professional, and institutional needs, while also supporting various sectors such as science, commerce, business, and other professional communities. In addition, IT facilitates collaboration across geographical, social, and ideological boundaries, thereby enhancing openness and information exchange [1].

Laravel is employed to develop the crab aquaculture monitoring system efficiently and securely at BBPBAP Jepara. This framework was chosen for its speed, security, and ease of maintenance. On the other hand, soft-shell crabs (*Scylla spp.*) are a high-value commodity with unstable production, thus requiring technological and policy support for Indonesia to become a leading global producer [2].

PHP is one of the most widely used web programming languages in the world, with more than 80% of websites globally built using this language. Its popularity is driven by ease of use and flexibility in developing both small- and large-scale web applications. However, as a dynamically typed scripting

language, PHP is often criticized for being less ideal for the development and maintenance of large-scale software systems [3].

XAMPP is a lightweight and portable web server package that facilitates local development of PHP and MySQL applications. Free and easy to use, XAMPP is popular among students and beginners. It is available in both full and lite versions [4].

Laravel supports database design through its migration feature, which allows for step-by-step creation and management of tables. This approach reflects the practice of forward engineering, namely transforming a conceptual model into an actual database structure [5].

Laravel is an open-source PHP framework that streamlines web development through features such as routing, authentication, and database management. By adopting the MVC architecture, Laravel promotes clean and structured code separation [6].

Tailwind CSS is a utility-first framework that enables interface development without the need to write custom CSS directly. Unlike Bootstrap, Tailwind offers high flexibility through modular classes for layout, colors, typography, and more [7].

This study analyzes user preferences toward interface design to ensure that the developed crab aquaculture website is attractive, user-friendly, and facilitates information access. The system is also designed to record data on crab growth, water quality, and feeding activities in a structured manner, while providing informative reporting features to support evaluation and decision-making at BBPBAP Jepara.

II. METHOD

2.1 Data Source

This study employs both primary and secondary data to support the analysis and development of the Web-Based Crab Aquaculture Monitoring Information System at BBPBAP Jepara using the Laravel framework. Primary data were obtained through interviews and direct observations of farmers, technical staff, and BBPBAP management in order to understand their needs, workflows, and recording challenges in the field. Meanwhile, secondary data were collected from books, journals, articles, institutional reports, and relevant technical documentation, serving as theoretical foundations and references in system design [8].

2.2 Data collection technique

A quantitative approach was conducted through the distribution of structured questionnaires to technical staff and farmers at BBPBAP Jepara to measure the usability, benefits, and satisfaction with the system. In addition, interviews were carried out to explore user needs, challenges, and feedback in depth, providing qualitative insights that complement the questionnaire data. Furthermore, a literature review was undertaken by examining journals, books, articles, and technical documents to strengthen the theoretical framework and support system development.

2.2 Thinking Framework

In this study, the structure of the thinking framework plays an important role in the development of the web-based vintage clothing sales information system. This framework functions to organize and explain the variables involved in the research. The application of the thinking framework is expected to facilitate a more structured and systematic review process. Figure 1 below presents the thinking framework used in this study.

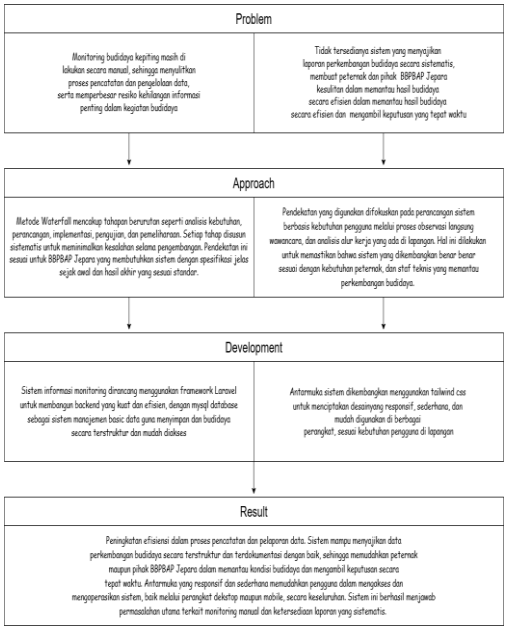

Figure 1. Monitoring Web Thinking Framework

2.3 Application Development Method

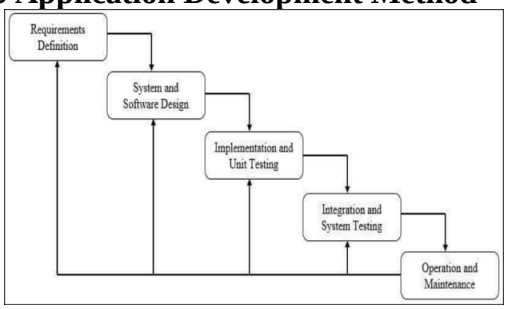

Figure 2. Waterfall Model

Figure 2 it's a picture of Waterfall, The Waterfall is a model sequential and systematic software development method, starting from analysis to final implementation. Introduced by Winston W. Royce (1970), this model is suitable for projects with requirements that are clearly defined from the beginning. This study adopts the Waterfall approach, which is divided into several stages:

a. Requirements Analysis

Identifying and defining the system's functional and non-functional requirements, usually documented in the form of use cases or a Software Requirements Specification (SRS).

b. System Design

Designing the architecture, user interface, database, and data structures based on the specified requirements, serving as the foundation for implementation.

c. Implementation

Building the system according to the design, including code development, database creation, and component integration.

d. Testing

Conducting tests to ensure that all features work properly and fixing any bugs discovered.

e. Maintenance

Handling system improvements, performance optimization, and adjustments according to evolving user needs.

III. RESULTS AND DISCUSSION

A. RESULTS

3.1 Database Design (ERD)

The Entity Relationship Diagram (ERD) is an essential tool in conceptual database design, representing entities and the relationships between them within a system. Although it is standard material in Computer Science and Information Systems, many students still struggle to convert an ERD into a relational schema. Such errors often occur due to a memorization-oriented approach without a deep understanding of the mapping principles, resulting in inaccurate relational models. Mastery of ERD must therefore be accompanied by an understanding of the transformation process into a logical model [9].

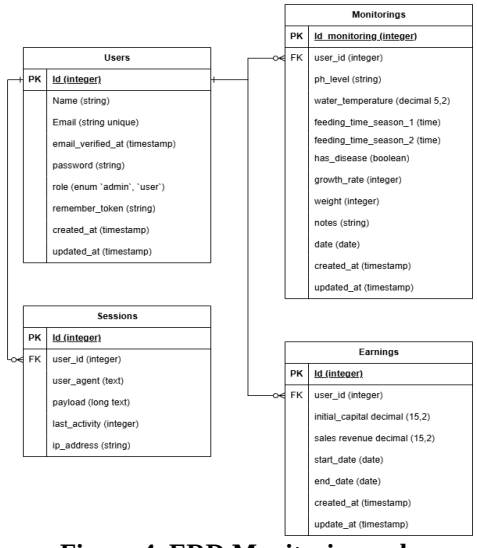

Figure 4. ERD Monitoring web

Figure 4 shows that the system consists of four main tables: *users*, *sessions*, *monitoring*, and *earnings*. The *users* table has a one-to-many relationship with the other three tables, represented in Laravel by the *hasMany* relationship. Conversely, each entry in the *sessions*, *monitoring*, and *earnings* tables belongs to a single user through the *belongsTo* relationship. This structure positions *users* as the central entity that manages authentication, user activity, monitoring data, and financial records, with clearly defined relationships among entities.

3.2 Flowchart

A flowchart is a fundamental diagram used to represent procedural flows systematically and logically. First introduced in the 1940s, the flowchart has become an essential visual tool for effectively conveying process-related information [10]. Flowcharts generally employ standard graphic symbols such as ellipses, diamonds, arrows, and other shapes to illustrate steps and decision points within a process.

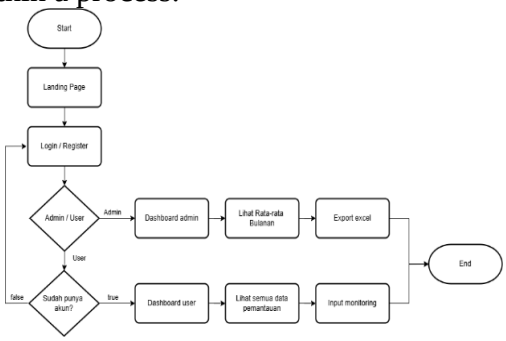

Figure 5. Flowchart Monitoring Web

Figure 5 presents the flowchart of the crab aquaculture monitoring system workflow. Users begin at the landing page and are then directed to the login or registration page if they have not yet signed in. After logging in, the system determines the user role: administrators are redirected to the dashboard to manage data and export reports, while regular users are directed to their dashboard to input monitoring data.

3.3 Use Case Diagram

In another section, the use case diagram is used to model the interaction between users and the system, employing the Unified Modeling Language (UML) approach. This diagram serves as the system's blueprint, supporting the development of other diagrams such as the activity diagram and assisting in the design of application mockups [11].

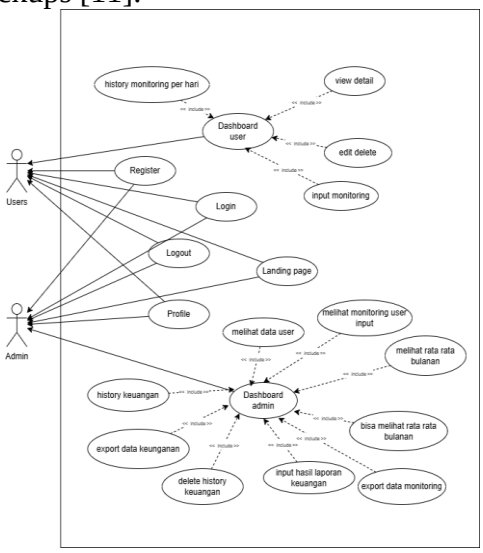

Figure 6. Use Case Diagram Web Monitoring

Figure 6 illustrates the use case diagram for the monitoring system, involving two main actors: the User and the Admin, each with distinct roles and access rights. The User has limited access and can perform several actions such as registration, login, and logout. After successfully logging in, the User can access the main page (landing page), manage their personal profile, and interact with features available on the User Dashboard. These features include recording daily monitoring data, viewing record history, editing or deleting previously entered data, and viewing detailed monitoring information.

B. DISCUSSION

As shown in Figure 9, the History Monitoring display presents the daily monitoring records in an interactive table containing information such as date, weight, session time, disease status, and action buttons for data management. The search and sorting features make it easier for users to browse and track conditions efficiently. Data access is managed through role-based access control, where administrators can view all records, while regular users can only view their own. Additionally, the system can be further enhanced with notifications and data

visualization through charts to support more comprehensive condition analysis.

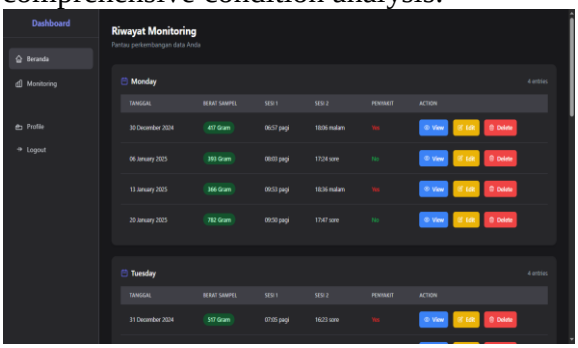

Figure 9. History Monitoring

As shown in Figure 10, the Create Monitoring page is designed for recording new monitoring data related to crab conditions and the pond environment. Similar to the edit page, it focuses on the initial entry of data, where users are required to fill in information such as the date, crab weight, water pH and temperature, feeding times (session 1 & 2), and health status.

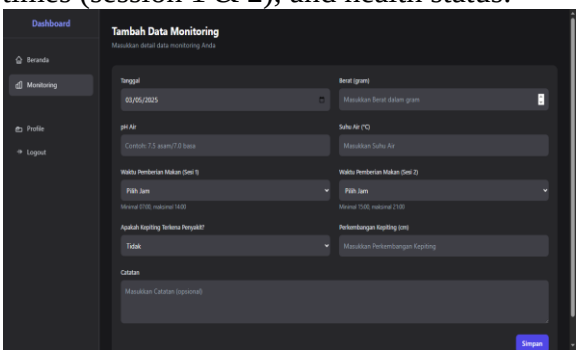

Figure 10. Create Data Monitoring

The User History Monitoring page, illustrated in Figure 11, provides a comprehensive view of daily crab monitoring records, including date, weight, measurement time, and health status. The data is presented in a clear and visual format, enabling easier tracking and analysis. In addition, features such as View Details, monthly filters, and Excel export (via Maatwebsite) help streamline the process of data evaluation and management.

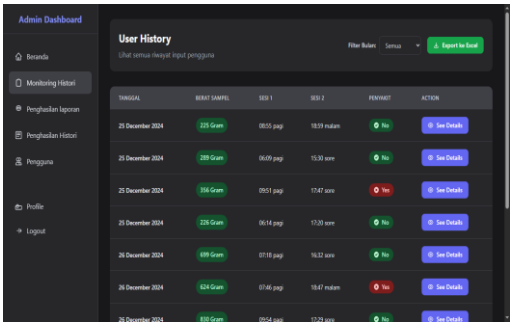

Figure 11. User History Monitoring

Depicted in Figure 14, the Excel Export feature allows users to download monthly income data in a structured spreadsheet format. The exported file contains essential financial details such as the entry number, initial capital, total sales, profit or loss, and the start and end dates of the reporting period. This feature enhances the process of financial recording, reporting, and analysis, ensuring data is presented in a clear, organized, and professional manner.

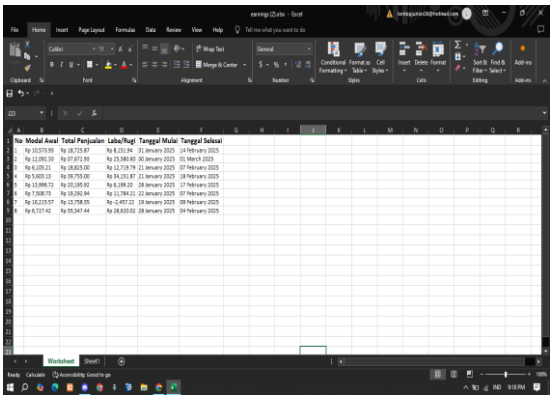

Figure 14. Excel Export Format Monitoring

As presented in Table 1, the Black-box Testing method focuses on evaluating the system's external behavior based on its inputs and expected outputs, without considering the internal code structure or logic. This testing approach helps identify functional errors, missing features, or incorrect outputs, ensuring that the system operates according to its specifications from the user's perspective.

Table: 1. Table Blackbox Testing

No	Fitur yang Diuji	Skenario Pengujian	Hasil Yang diharapkan	Hasil Pengujian
1	Login	Pengguna memasukkan email dan password yang benar	Pengguna berhasil login dan diarahkan ke halaman	Berhasil

No	Fitur yang Diuji	Skenario Pengujian	Hasil Yang diharapkan	Hasil Pengujian
			dashboard	
2	Login	Pengguna memasukkan email atau password yang salah	Login gagal, muncul pesan "Email atau password salah"	Berhasil
3	Registrasi User	Membuat pengguna baru dengan data lengkap	Data user berhasil disimpan dan muncul di daftar pengguna	Berhasil
4	Middleware User & Admin	User Tidak bisa masuk ke halaman admin dan begitu juga sebaliknya	Bisa Melihat halaman sesuai Rolenya	Berhasil
5	Lihat Daftar Penggun a (admin)	Admin membuka halaman manajemen pengguna	Seluruh data pengguna tampil dengan benar	Berhasil
6	Delete Data Penggun a (admin)	Admin delete data user	Data berhasil di delete diperbarui	Berhasil
7	Input Data Keuanga n (admin)	Admin mengisi laporan modal awal dan hasil penjualan	Data berhasil disimpan dan muncul di daftar laporan keuangan	Berhasil
8	Delete Data Keuanga n (admin)	Admin delete nilai penjualan	Data keuangan terhapus sesuai input baru	Berhasil

As summarized in **Table 2**, the results of **user interviews** show that the crab monitoring system has brought a **positive impact** on both operational activities and data management. **Field officers** mentioned that the system significantly **simplifies the process of recording and tracking crab growth data**, making monitoring more efficient and organized in daily operations.

Table:2 Interview User Monitoring Web

No	Wawancara	Hasil Wawancara
1	Apa peran Bapak dalam penggunaan sistem monitoring ini?	Saya berperan sebagai penanggung jawab operasional di lapangan sekaligus admin sistem. Selain itu, saya juga mencoba langsung sistem ini sebagai user untuk memahami alur penggunaannya.
2	Bagaimana pendapat Bapak tentang kemudahan penggunaan sistem?	Secara keseluruhan, sistem ini sangat mudah digunakan. Navigasi menunya jelas dan fitur-fitur penting seperti input data, laporan, dan penjadwalan mudah diakses. Bahkan staf lapangan yang sebelumnya kurang familiar dengan teknologi bisa beradaptasi cukup cepat.
3	Apakah sistem ini membantu dalam pencatatan dan monitoring budidaya kepiting?	Sangat membantu. Sistem ini menggantikan pencatatan manual yang sering tidak konsisten. Sekarang setiap data harian bisa dicatat secara rapi, mulai dari suhu air, pH, hingga pertumbuhan kepiting. Fitur histori data juga berguna untuk evaluasi siklus sebelumnya.
4	Bagaimana Bapak melihat sistem ini dari sisi pengelolaan data dan pelaporan?	Dari sisi admin, sistem ini sangat memudahkan dalam pengumpulan dan rekap data. Laporan bulanan bisa di-generate otomatis dan formatnya rapi. Kami juga terbantu dengan fitur ekspor ke PDF dan Excel.
	Apakah Bapak memiliki kritik atau saran untuk pengembangan sistem kedepannya?	Secara umum sistem sudah bagus, tetapi akan lebih baik jika bisa terintegrasi langsung dengan sensor otomatis, misalnya untuk suhu dan pH, agar data masuk secara real-time. Selain itu, versi mobile juga penting agar petugas di lapangan bisa input data langsung dari HP. Mungkin juga bisa ditambahkan sistem notifikasi jika ada anomali pada data air atau jadwal yang terlewat.

IV. CONCLUSIONS

In the research and development of the web-based crab aquaculture monitoring

information system at BBPBAP Jepara using the Laravel framework, the following conclusions can be drawn:

1. The system supports structured and efficient recording and monitoring of crab aquaculture, covering growth data, water quality, feeding schedules, and disease status.
2. The interface is designed to be user-friendly on both desktop and mobile devices, replacing manual processes with digital features such as automated summaries and feeding records.
3. User evaluations indicated positive responses, as the system improves coordination, reporting, and daily data management.
4. Interactive reporting features and Excel export (via the Maatwebsite library) facilitate analysis and support decision-making.
5. The system enhances transparency and collaboration through structured workflows and role-based access control, thereby reducing the risk of data loss.

These conclusions demonstrate that the developed system aligns with the operational needs of BBPBAP Jepara and makes a tangible contribution to the digital transformation of crab aquaculture monitoring.

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