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DESIGN OF A WEB-BASED FISH SALES INFORMATION SYSTEM TO IMPROVE MARKETING EFFICIENCY USING THE WATERFALL MODEL

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Abstract

The development of aquaculture activities requires effective sales and marketing management to support business sustainability. This study aims to design and build a web-based fish sales information system to improve marketing efficiency and operational performance at the Cerme Rice Pond, Gresik Regency. Problems encountered include manual recording of sales and inventory, inconsistencies in stock data, and delays in report preparation, which impact service quality and managerial decision-making. The method used in this study is the Software Development Life Cycle (SDLC) with the Waterfall model, which includes the stages of needs analysis, system design, implementation, and testing. The system was developed web-based to integrate the management of fish data, inventory, sales transactions, operational activities, and reports in one centralized database. System testing was conducted using the black-box testing method to ensure functional suitability, and User Acceptance Testing (UAT) using a Likert scale to measure the level of user acceptance. The results of the study indicate that the developed system is able to improve data recording accuracy, accelerate real-time information access, and support the preparation of structured sales reports. The UAT results obtained a score of 85.6%, categorized as *very good* , indicating that the system is acceptable to users and meets the operational needs of the ponds. The novelty of this research lies in the implementation of an integrated web-based fish sales information system specifically designed to support marketing efficiency in village-scale aquaculture businesses.

Keywords: Web-Based Information System, Fish Sales, Marketing Efficiency, Waterfall Model, Aquaculture

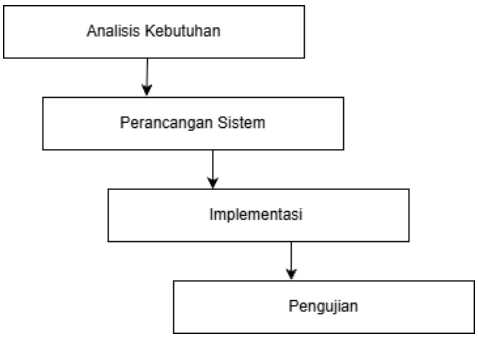
1. Introduction

Aquaculture is a strategic sector in supporting food supply and the regional economy. Based on data from the Central Statistics Agency (BPS, 2023), aquaculture production results experience dynamics between periods, so business actors need to ensure the accuracy of inventory and sales transactions [1], [2]. Data from the Central Statistics Agency of Gresik Regency (BPS Gresik, 2023) shows that aquaculture, including ponds, is one of the leading sectors developing in the coastal areas of Gresik Regency. Increased cultivation activities in 2025 require business management readiness, especially in data management and customer service. Manual record-keeping risks causing stock discrepancies and service delays. Implementing a system simplifies automated record-keeping, product information presentation, and real-time data access for both managers and customers. Therefore, information technology support plays a crucial role in business support to improve operational efficiency and service quality in aquaculture businesses [5], [6]. Cerme Rice Pond is a fish farming area located in Cerme District, Gresik Regency, East Java. This pond has great potential for fish farming activities. However, the cultivation and sales business processes are still carried out manually, especially in recording stock and transactions, which has the potential to cause inventory discrepancies and difficulties in preparing sales reports [7], [8]. This condition can hamper operational effectiveness and reduce the quality of service to customers. Several researchers have provided solutions in the form of developing web-based sales information systems in different business sectors, such as retail stores and MSMEs, to assist in recording transactions, managing inventory, and preparing reports automatically (Tamam, 2024; Astuti, 2024) [9], [10]. Other studies also discuss the application of web-based systems to improve service efficiency, accelerate access to product information, and minimize data input errors in the sales process (Putra, 2024) [11]. The results of these studies indicate that web-based sales systems are effective in supporting inventory control and structured data processing [9]–[11]. Therefore, this study will design and build a web-based fish sales information system at Tambak Beras Cerme, Cerme District, Gresik Regency. System development is carried out using the SDLC

Waterfall model method which includes analysis, design, implementation, testing, and maintenance. This research is expected to simplify the management of product data, inventory, and sales transactions, as well as the creation of faster, more accurate, and structured reports. The theoretical contribution of this research is to provide a reference for the development of a web-based sales information system in the aquaculture sector. Furthermore, its practical contribution is expected to assist pond managers in improving operational efficiency, accelerating customer service, and supporting data-driven decision-making.

2. METHOD

This research uses the Waterfall method . The system development stages follow the Waterfall model, as shown in Figure 1.1 . This stage includes needs analysis, system design, implementation, and testing. Testing is conducted to ensure the system functions according to user needs and supports the sales process and inventory management more effectively.



Gambar 1. *Model Waterfall*

2.1 Needs Analysis

The requirements analysis phase is conducted to identify system requirements based on existing business processes, encompassing both functional and non-functional requirements. Functional requirements encompass managing fish product data, inventory, sales transactions, and generating sales reports. Non-functional requirements encompass ease of use, access security, and system performance to ensure effective use in business operations.

2.2 System Design (System Design)

The system design phase involves drafting the database structure, user interface design, and system modeling using relevant diagrams. This design aims to provide a comprehensive overview of the system flow and relationships between components before entering the implementation phase. The design results serve as a reference in the application development process to ensure it meets user needs.

2.3 Implementation (Work)

The implementation phase is the process of translating the design results into a web-based application. During this phase, all the system's core functions are developed, including fish data management, sales transaction recording, inventory management, and sales reporting. Implementation is carried out in stages to ensure each module operates as designed.

2.4 Testing

The testing phase is carried out to ensure the system runs as required and produces correct output. Testing is conducted using a black-box testing method that focuses on the suitability of input, process, and output for each system function [7]. Next, User Acceptance Testing (UAT) is carried out to evaluate the level of user acceptance, assess the suitability of features to operational needs, and ensure the system is ready for use in a real work environment [5].

3. Results and Discussion

3.1 Needs Analysis

At this stage, a needs analysis was conducted as the basis for developing a web-based fish sales information system. Functional requirements include user input (admin and customer), fish data management, stock, and sales transactions, as well as report generation. Output includes product information and sales reports. Non-functional

requirements include ease of use, access security, and application performance to ensure the system runs optimally to support farm operations.

3.1.1 Identification of System Actors

Actor identification aims to determine the parties who interact directly with the web-based fish sales information system at the Cerme Gresik Rice Pond. Based on the results of the needs analysis represented through the Use Case Diagram, the system involves two main actors, namely the Admin/Pond Manager and the Farmer (Operational User). The Admin has full access rights to the system and is responsible for managing master data, including farmer data, fish data, and user profiles. In addition, the admin is also authorized to manage and confirm orders, record sales, prepare sales reports, and manage expenditures and approve operational costs. Farmers act as operational users, responsible for inputting farm operational requirements, recording harvest yields, and viewing order data according to their assigned authority. This division of roles aims to separate administrative and operational functions, resulting in a more structured workflow, better data control, and increased efficiency in managing farm business processes.

3.1.2 Impact of the System on the Fish Pond Business Process

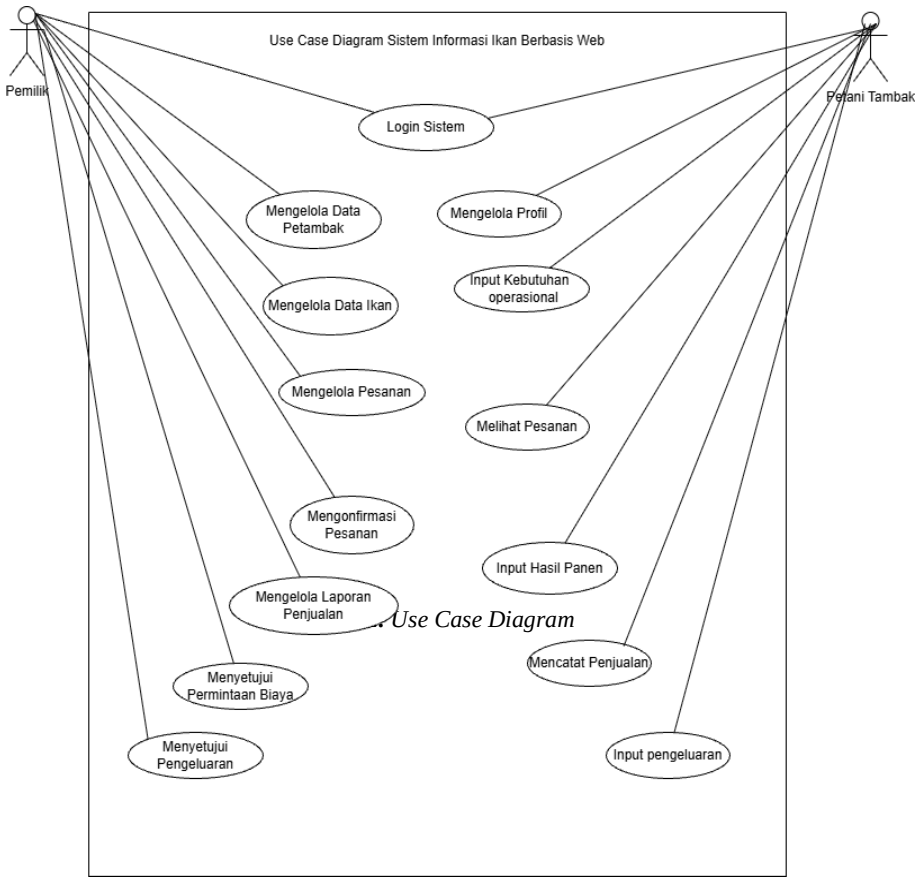
The implementation of a web-based fish sales information system has positively impacted the effectiveness and efficiency of the business processes at Tambak Beras Cerme, Gresik. This system replaces manual record-keeping with a more systematic and documented system through integrated management of master data, orders, sales, and reports. The primary impact is increased accuracy of inventory and transaction data because all data is stored in a centralized database, reducing the risk of recording errors and data loss.

3.2 Design

The design of a web-based fish sales information system application consists of a use case diagram, Admin/Pond Manager activity diagram, farmer activity diagram, ERD.

3.2.1 Use Case Diagram

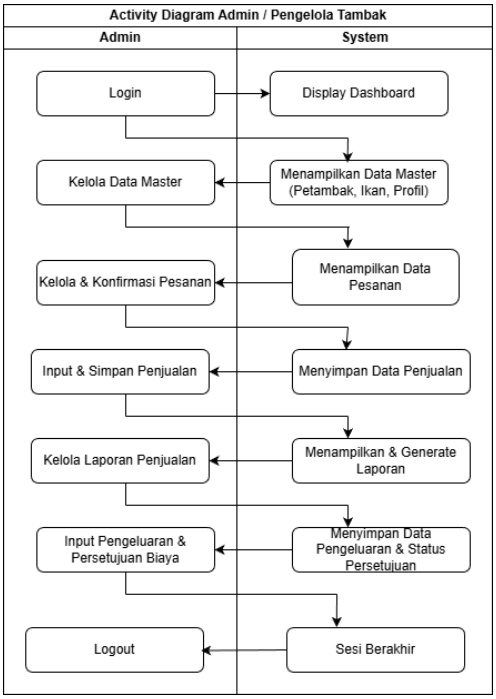
This Use Case Diagram involves two main actors: the Admin/Pond Manager and the Farmer. The Admin manages master data, processes and confirms orders, records sales, compiles reports, and manages expenditures and cost approvals. Meanwhile, the Farmer inputs operational requirements, harvest results, and views orders according to their access rights. Figure 1.2 shows a Use Case Diagram representing system functions and user interactions in supporting the farm's business processes.



. Use Case Diagram

3.2.2 Activity Diagram for Admin/Pond Manager

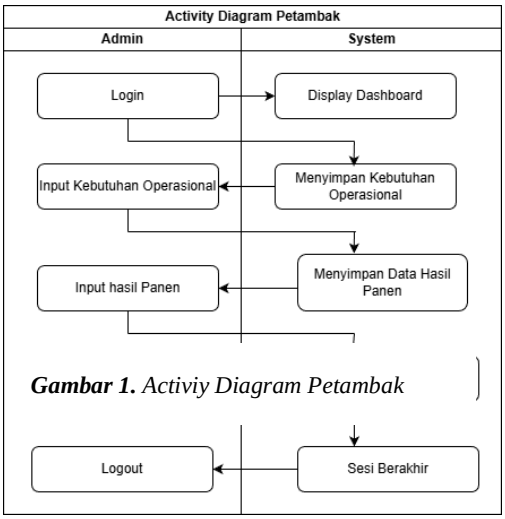
The Admin Activity Diagram is used to illustrate the flow of Admin activities in operating a web-based fish sales information system. The process begins with logging in, then the Admin accesses the dashboard and master data menu. Next, the Admin manages master data, processes and confirms orders, records sales, manages sales reports, and records and approves operational expenses. After all activities are completed, the process ends with a logout to close the system usage session. Figure 1.3 shows the systematic Admin workflow in supporting the operational management and marketing of ponds.



Gambar 3. *Activity Diagram Pemilik*

3.2.3 Activity Diagram ofFish Farmers

The Farmer Activity Diagram is used to illustrate the flow of operational user activities in supporting pond activities. The process begins with logging in, after which the farmer inputs operational requirements and harvest results, which are then saved into the system. Furthermore, the farmer can view order data according to the authority granted as part of the operational process. After all activities are completed, the process ends with a logout, closing the system usage session. This diagram represents the farm's operational workflow, which is crucial for providing accurate production data to support the sales process.
provide accurate production data to support the sales process.

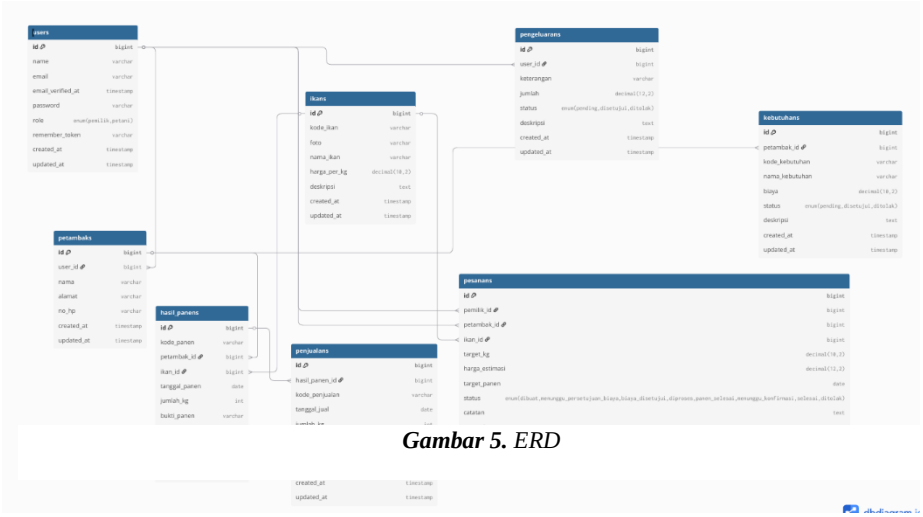


Gambar 1. *Activiy Diagram Petambak*

3.2.4 Entity Relationship Diagram (ERD)

An Entity Relationship Diagram (ERD) is used to model the database structure and relationships between key entities in a web-based fish sales information system. The core entities in the system include users, farmers, fish, orders, harvests, sales, expenses, and needs, which are interconnected through primary and foreign key relationships. This ERD serves as the basis for database design to support centralized integration of operational

and transaction data. With this structure, the system can store data in an organized manner and produce accurate reports according to the needs of the Cerme Rice Pond, Gresik. Figure 4 shows the ERD design used in this study.



Gambar 5. *ERD*

3.3 Implementation (Work)

The implementation phase is the process of applying the system design into a user-friendly application. The web-based fish sales information system developed in this study is named SIPENIK (Fish Sales Information System) and is being implemented at the Cerme Gresik Rice Pond. The system implementation aims to facilitate integrated sales data management, including fish data, orders, sales, and operational activities, all within a single web-based platform.

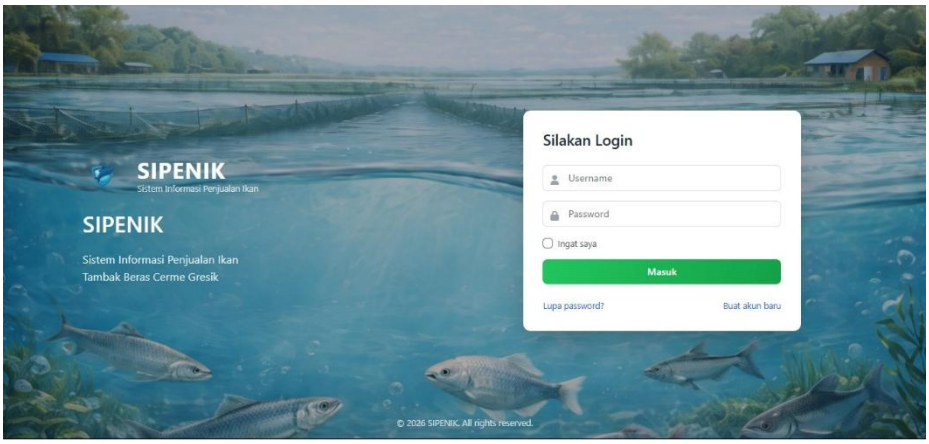


Figure 6. *SIPENIK Login Page Dashboard*

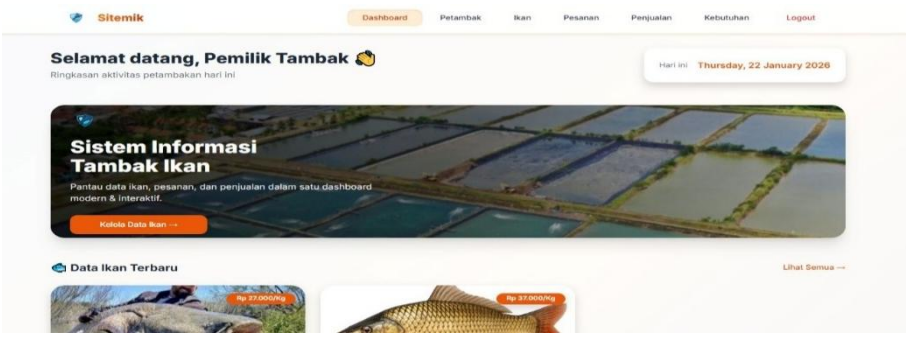
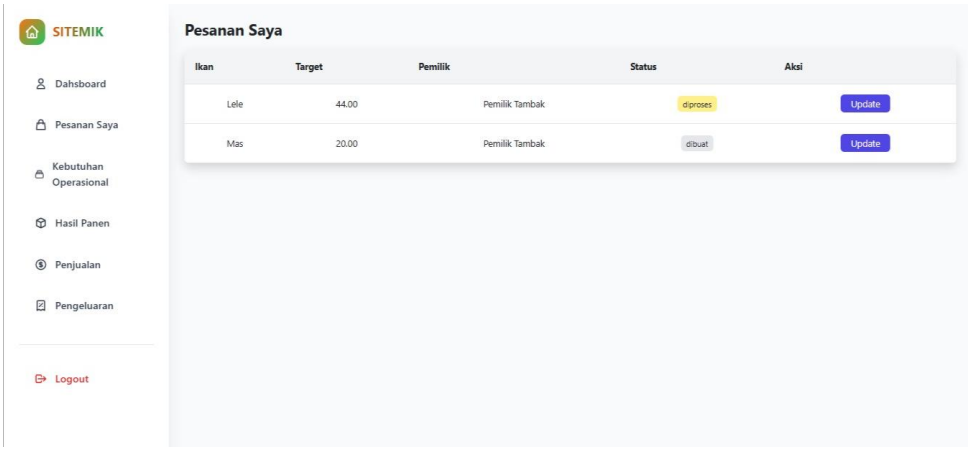


Figure 7. *SIPENIK Login Page Display*

In addition to the owner dashboard, the system also displays a My Orders page in the farmer's account for structured order data management. On this page, users can view a list of orders by fish type, target quantity, farm owner, and order status. The system also provides action buttons to update order status as the process progresses, allowing for faster coordination between the farm owner and farmer and documenting it within the system.



Gambar 8. *Tampilan Halaman Saya Petambak*

3. 4 Testing

User Acceptance Testing (UAT) was conducted to determine the level of user acceptance of the web-based Fish Sales Information System. UAT was conducted after users tried the system directly, then completed a questionnaire based on their experience using the system's features. Respondents in this test consisted of Admin/Fish Farm Managers and Farmers (Operational Users). The assessment used a Likert Scale to measure ease of use, feature suitability, and the system's benefits in supporting fish farm operations.

Table 1. UAT Questionnaire Questions

No	Question
1	Does the system facilitate the management of fish data and inventory stock?
2	Does the system make it easier to record sales transactions?
3	Does the system help with the order confirmation and monitoring process?
4	Does the system make it easy to create and view sales reports?
5	Is the system easy to use by users (Admin/Fish Farmers)?

Table 2. Likert Scale Weights

Answer Scale	Weight
Strongly Agree (SS)	5
Agree (S)	4
Enough (C)	3
Disagree (TS)	2
Strongly Disagree (STS)	1

Table 3. Result Criteria

Scale	Percentage	Criteria
Strongly Agree (SS)	81% – 100%	Very good
Agree (S)	61% – 80%	Good
Enough (C)	41% – 60%	Enough
Disagree (TS)	21% – 40%	Not enough
Strongly Disagree (STS)	0% – 20%	Very less

Table 4. Summary of UAT Questionnaire Answers

Scale	Number of Answers	Weight	Total Score
STS	0	1	0
TS	1	2	2
C	3	3	9
S	9	4	36
SS	12	5	60
Total	**25**		**107**

The UAT percentage is calculated using the formula:

$$\text{Persentase} = \frac{\text{Total Skor}}{\text{Skor Maksimum}} \times 100\%$$

$$\text{Persentase} = \frac{107}{125} \times 100\% = 85{,}6\%$$

Based on the UAT calculation results, a score of 85.6% was obtained, which falls into the Very Good category (81%–100%). These results indicate that the web-based Fish Sales Information System is acceptable to users and meets the operational needs of the Cerme Gresik Rice Pond. Therefore, the system is deemed suitable for use to assist with data management, sales transactions, and faster and more structured report preparation.

4. CONCLUSION

Based on the results of research conducted in the Cerme rice ponds, Cerme District, Gresik Regency, the following conclusions were obtained:

1. This research successfully designed and built a web-based fish sales information system to support the management of fish data, inventory stock, sales transactions, orders, operational expenses, and the creation of integrated sales reports.
2. Testing using black-box testing shows that all features in the system run according to their designed functions and produce output that meets requirements.
3. Based on the results of User Acceptance Testing (UAT) using the Likert scale, a percentage of 85.6% was obtained, so the system is included in the very good category and is declared suitable for use in supporting operational processes and services at the Cerme Gresik Rice Pond.

Suggestions for further research include developing the system into a mobile app, adding automatic notification features for order and transaction status, and expanding the system's scope for use on larger farms. Furthermore, the system could be enhanced by adding digital payment features and more comprehensive reporting integration to support managerial decision-making.

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