

Fishing Pond Management System

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Abstract

Pond fishing is a common hobby that can be done in public lakes as well as small backyard ponds. Effective information management is essential to keep fish healthy, satisfy customers, and increase pond profitability. Workers help pond managers track fish stocks and manually record customer orders using paper forms and basic spreadsheets, often resulting in errors and inefficiencies. This project proposes creating an online Fishing Pond Information Management System to address these issues. Many management tasks, such as inventory control, order administration, and report preparation, will be automated and integrated by this system. The system development followed a structured approach combined with a prototyping methodology. PHP programming and MyPHPAdmin were utilized as core development tools for implementing the backend and database management. User-friendly interfaces and real-time reporting tools were designed to facilitate operations and ensure seamless access to critical data. The study involved extensive testing to ensure system functionality, including inventory management accuracy and error reduction. Results demonstrate a significant improvement in operational efficiency, accuracy, and customer satisfaction. The digitized system reduces the risk of manual errors and enables informed decision-making through real-time data insights. Further research is recommended to enhance the system by incorporating predictive analytics for fish stock replenishment and exploring integration with mobile platforms for broader accessibility.

1. Introduction

Pond fishing is a popular recreational activity that involves catching fish from a pond, which can vary in size from small backyard ponds to larger public lakes. A fishing pond is a man-made or natural body of water mainly built, maintained, and stocked for recreational fishing [1]. These ponds are often stocked with various fish species, such as snapper, barramundi, red tilapia, or red snapper. This is to create a regulated environment in which people may fish for pleasure or sport. Pond fishing has become a commercialised and recreational activity [2]. The main factor for some anglers to participate in fishing activities is getting fish or doing it as a hobby. There are also organized fishing competitions with lucrative prizes. Most recreational fisheries are privately owned fishing ponds where fish are either bought from the hatchery and then deposited into the pond or from food fish production facilities directly and grown from the catch [3]. Anglers then pay a fee to fish in that pool [4]. These ponds are usually managed at a lower feeding rate and stocking density than aquaculture ponds.

Pond fishing management has data management requirements just like any other farm. Systematic monitoring of client information, pond health, finances, and operations are all part of running a pond fishing business [5]. Essential tasks encompass creating a client database and loyalty schemes, keeping an eye on fish

numbers, pond conditions and pond facility, recording costs and income, and organizing personnel schedules and upkeep [6]. While marketing analytics assist customize promotions, technology such as management software and mobile apps can expedite operations. Furthermore, it is critical to prioritize sustainability through community involvement and conservation initiatives. Consistent reporting and data analysis facilitate well-informed decision-making, guaranteeing a prosperous and delightful client experience.

In this study, an observation was made at one Selangor fishing pond. The Fishing ponds are operated by the owner, Abi Yazid Bin Zolkepli, who is responsible for the pond ecosystem's sustainability and customer happiness. These fishing ponds' recreational areas are in Kampung Ayer Tawar, serving as leisure sites for fishing enthusiasts and revenue-generating assets. The fishing pond has been operating for eight years. The place is open daily from 8:00 AM to 7:00 PM. Also, the place is busiest on Saturdays and Sundays, with fewer customers from Monday to Friday. The fee charged for customers fishing at the fishing pond is RM3. The fishing pond comprises six ponds, each acre containing one fish species: Barramundi, Red Snapper, Red Tilapia or Snapper. The owner changes the water in each pond every eight months, while the fish farming pond is refreshed every two weeks to avoid smelling and dirty water. Fish are restocked at night after the shop closes when stocks are low. Additionally, when customers catch a fish from the pond, they must purchase it based on its weight and species. Each species has a specific price per kilogram. Red Tilapia is priced at RM15 per kilogram, Red Snapper at RM35 per kilogram, Snapper at RM40 per kilogram, and Barramundi at RM22 per kilogram.

Customers can book rod fishing and bait on the counter. Bait options include shrimp, dead fish, mackerel and bran, although customers can bring their own bait. A rule must be followed here: fish cannot be released back into the pond once caught. It is to prevent the fish from dying in the pond. Furthermore, the fish are not fed in the fishing ponds to ensure they take the bait, but they are fed in the fish farming pond before release. Finally, customers can pay using payment methods, including cash, bank transfers, QR payments, and PayWave.

Next, effective information management is crucial for keeping the fish healthy, ensuring customer satisfaction and increasing pond profitability. Staff assist the fishing pond's manager in managing the fishing pond, tracking fish stock, and generating reports. This method usually involves using paper forms and simple spreadsheets to record and preserve information. Customer bookings are documented in logbooks, and fish stock is managed by manual counting and handwritten records. In certain circumstances, essential software such as Excel may be utilised for data storage, but no integrated system is in place to simplify these processes. The reliance on manual methods frequently results in inefficiencies and errors, affecting the overall management of the pond. Therefore, the Fishing Pond management system helps manage data storage for this fishing pond.

To address these challenges, this project proposes developing a Fishing Pond Information Management System based on the requirements found in the case study location. The system will be a web-based application that automates and combines all management and management areas, including booking management, inventory control, and report generation. By digitising these operations, the system will reduce mistake rates, offer real-time data for improved decision-making, and improve customer satisfaction via an easy-to-use web interface. Additionally, the suggested technology would speed up operations and provide data-driven insights to pond managers, allowing them to optimise resources and increase overall efficiency.

This paper is organized into five sections. The first section introduces the project background. The second section gives a review of related work to the study. Project methodology and findings from analysis and design are explained in section three. Section four demonstrates the results and their discussion. Section five ends the paper with a conclusion.

2. Related Work

A fishing pond often provides anglers of all ages with a calm and pleasant atmosphere [7]. Situated in a scenic area, the organization offers clean, well-kept fishing ponds stocked with various fish species, guaranteeing a thrilling experience for both beginning and seasoned fishermen [6]. Families and friends may unwind and enjoy the outdoors with the help of amenities like picnic tables, cozy seating places, and covered areas [8]. The business makes it easy for guests to have complete fishing experience by providing amenities, including fish cleaning stations, equipment rentals, and restrooms [9]. Special events like family days and fishing competitions are frequently planned to include the community and foster a passion for fishing. Instructional sessions on conservation and fishing techniques are also provided to promote a greater understanding of sport and the environment.

In this project, a case study has been organized at Kampung Ayer Tawar Fishing Pond. It is an eight-year-old enterprise in Selangor, Malaysia. It offers a recreational fishing setting where customers may catch Snapper, Red Snapper, Red Tilapia and Barramundi. The pond is open daily from 8:00 a.m. to 7:00 p.m. and is busiest on weekends. The facility has six ponds, each acre in size, with water changes and fish restocking occurring regularly to ensure a healthy environment. Furthermore, when customers catch a fish from the pond, they must purchase it based on its weight and species. Each species has a specific price per kilogram. Red Tilapia is priced

at RM15 per kilogram, Red Snapper at RM35 per kilogram, Snapper at RM40 per kilogram, and Barramundi at RM22 per kilogram.

Currently, the pond's management uses manual techniques, such as logbooks, recording client reservations, tracking fish populations, and creating reports. These manual operations frequently result in inefficiencies and mistakes. For example, manual data entry raises the possibility of stock management mistakes or customer booking misinterpretation. Additionally, pond managers need real-time updates to make informed decisions about fish restocking or facility upkeep. The lack of a unified digital system also hinders the capacity to collect valuable data, such as client preferences or fish stock. Figure 1 shows the customer flow chart and stock inventory management chart.

Hence, a Fishing Pond Management System is required to overcome the present operating limitation. The new system will automate essential activities, including customer information, pond management information, stock inventory tracking, and report generation, lowering the risk of mistakes and increasing overall efficiency. By delivering real-time data, the technology will assist management in making better decisions, increasing client satisfaction, and ensuring the pond's sustainability.

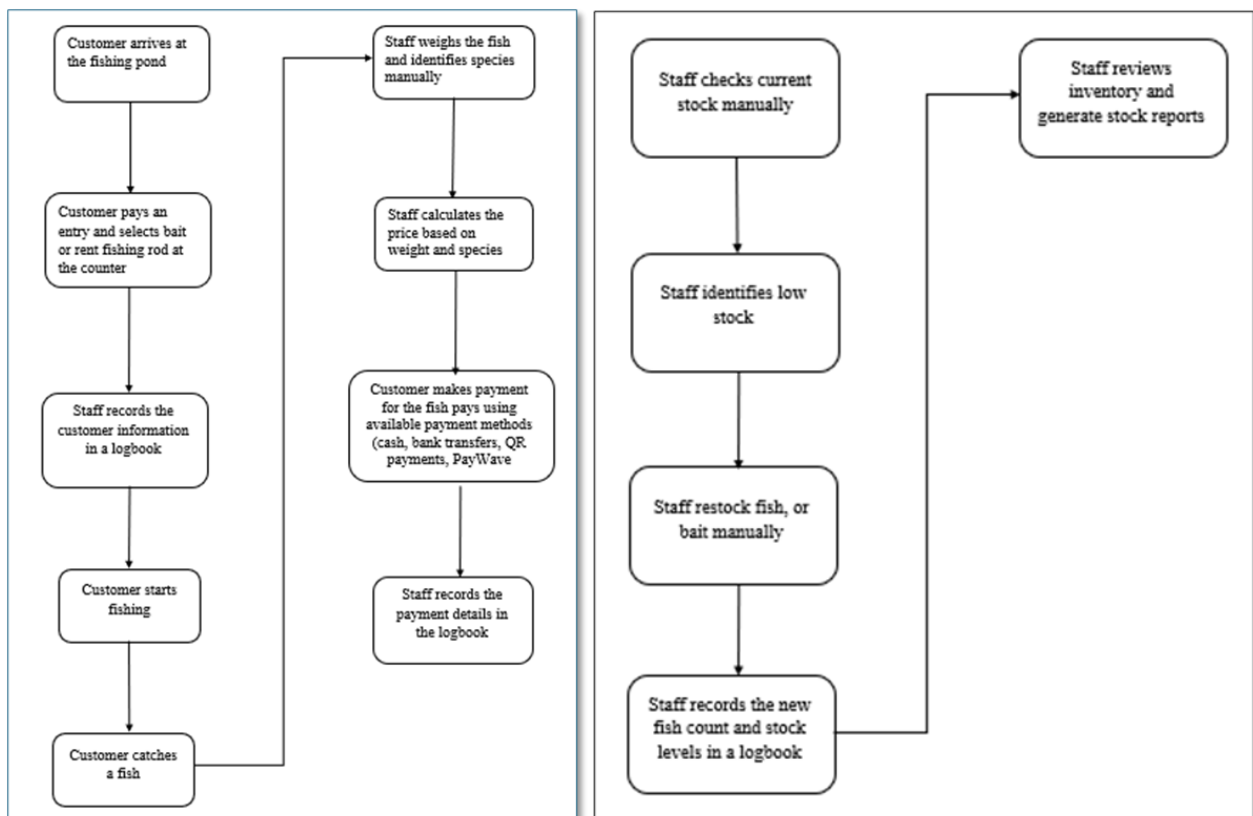


Fig. 1 Customer/Fisher Flow Chart

The Fishing Pond Management System is a web-based program created to help Kampung Ayer Tawar's fishing pond run more smoothly. A web-based information system (WBIS) has been optimized to develop a new system for fishing pond management. WBIS is an internet-accessible software application that enables data storage, management, and processing in a centralized manner [10]; [11]. Users can access information and perform tasks from anywhere with an internet connection. In a Fishing Pond Management System context, a WBIS brings substantial benefits. It offers centralized data management, where all information concerning customer bookings, stock inventory, and financial transactions is stored and managed in one central database [12]; [13].

This system focuses on critical aspects such as online booking management, stock and inventory tracking, pond information, customer information and report generation. Its user-friendly design makes it simple for pond personnel and customers to operate the system, ensuring that pond resources and reservations are managed efficiently. Unlike advanced commercial systems like PondKing or AquaManager, which include complicated features such as automatic water quality monitoring, this system is simple, inexpensive, and designed primarily for small-scale pond operations. While it requires manual inventory updates and lacks specific high-end capabilities, it serves the pond's basic requirements without overloading users with needless complexity. The Fishing Pond Management System draws inspiration from current systems such as Hulu Langat

Fishing Resort. It incorporates key financial capabilities, offering a practical, accessible, cost-effective alternative for managing daily pond operations.

Along with the study, three existing fishing pond management systems have been analyzed: PondKing, AquaManager, and Hulu Langat Fishing Resort. Firstly, PondKing is a web application that offers features such as fish stocking management, water quality monitoring, customer management and report generation. On the other hand, AquaManager offers feeding schedule optimization, fish development monitoring and reporting. Furthermore, Hulu Langat applies online booking. Booking notifications and customer database management.

The existing systems offer various features to meet different needs in fishpond management. While some systems are comprehensive, complex, and expensive, others are simple but lack essential features. Our proposed system aims to combine the best features of these systems while addressing their limitations. It will include modules such as login and registration, pond management information, customer information, stock inventory, and report generation. This will make the system user-friendly, affordable, and suitable for small to medium-sized fishing pond operations. Table 1 summarizes the findings of the system's comparison.

Table 1: System Comparison

System Features	PondKing [3]	AquaManager [4]	HL Fishing Resort [5]	Fishing Pond Management System
Log in and registration	√	X	X	√
Pond Information Management	√	√	X	√
Customer Information	√	X	√	√
Stock Inventory	√	X	√	√
Report Generation	√	√	X	√
Sales Income	√	X	√	√

3. Methodology

The development model chosen is a Prototyping Model. The prototyping model is a system development methodology focusing on creating and refining prototypes through iterative feedback and improvement. This approach helps ensure the final system aligns closely with user needs and improvement. There are a total of nine phases in the prototype model. As shown in Table 2, each phase has its own assignment and output that need to be produced during the entire project development. Besides that, the output was completed within the specific days that have been given.

Table 2 Software Development Activities and Their task

Phase	Task	Output
Planning	- Proposed the project - Determine the project schedule, activities and output	- Project proposal - Gantt chart
Analysis	- Gather user requirements through interviews and observations - Analyze the current manual system	- User requirement report - Data Flow Diagram (DFD) - Entity Relationship Diagram (ERD) - Flowchart
Design	- Design the system prototype (user interface and architecture) - Plan the database structure	- System architecture - Database schema and data dictionaries - User interfaces design

Table 2: (cont)

Phase	Task	Output
Prototyping	- Develop a working prototype based on the design - Set up the database and code basic features	- Functional prototype - Initial system modules
User Evaluation	- Conduct user testing with the prototype - Gather feedback from the pond manager and staff	- User feedback report - Revised system requirements
Refinement	- Refine the prototype based on user feedback - Adjust design and functionality as needed	- Updated prototype - Refined system specifications
System Testing	- Conduct comprehensive testing on the refined system - Perform functional and non-functional testing	Test case
Implementation	- Implement the system at the Kampung Ayer Tawar fishing pond - Migrate existing data to the new system	- Deployed system - Data migration report
Maintenance	- Monitor system performance - Fix any post-deployment issues - Perform regular updates	- Maintenance logs - System updates and fixes

3.1 Planning Phase

The project's planning was the main priority in the early phases of creating the Fishing Pond Management System. Determining the system's functionality, the duration of its development, and our goals were all part of this. A schedule was created, and significant checkpoints were established to monitor progress. A Gantt chart was made as a visual plan to show when each task should be finished. Much work went into ensuring the plan was understandable and practical, and user needs were determined through conversations with system users. This methodology enabled a methodical commencement of the system's development.

3.2 Analysis Phase

The next stage after project planning was to ascertain the users' requirements for the Fishing Pond Management System. Discussions and observations were made regarding the current manual work process. User requirements and improvement areas were identified with this method's aid. A Data Flow Diagram was constructed to show how the present manual system works, and a report was generated to describe the findings. This data would help develop a more effective system. An entity-relationship diagram (ERD) shows the relationships between the data and the end products.

3.2.1 Context Diagram

Three users are involved in this proposed system: the customer, the staff, and the manager. Information and data that interact between users and the system will be presented in Figure 2.

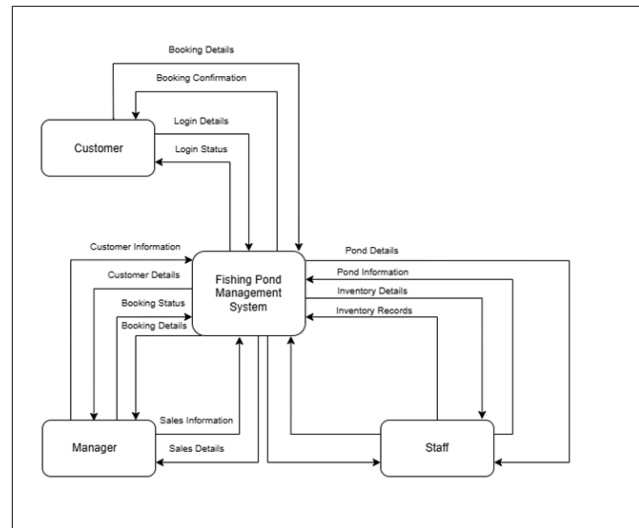


Fig. 2 Context Diagram

3.2.2 Data Flow Diagram

There are six functional modules: user login and registration, tool details, maintenance management, tool report, and vendor management. The eight databases will store the data from the six modules in the proposed system. All the information is in the level 0 data flow diagram shown in Figure 3.

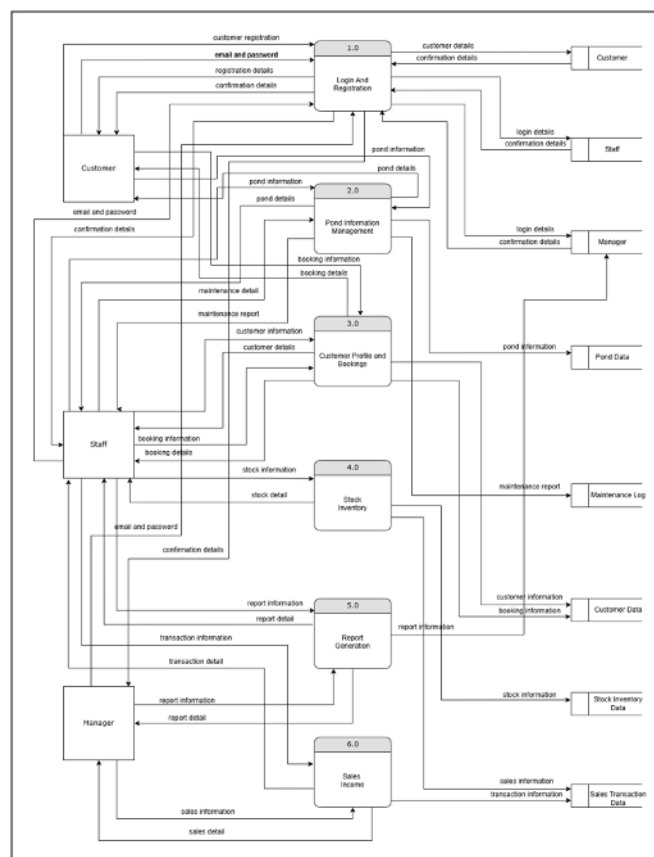


Fig. 3 Level 0 Data Flow Diagram

3.2.3 Entity Relationship Diagram

A total of seven entities are shown in Figure 4. These entities are Manager, Staff, Customer, Booking, Report, Pond, Inventory, Maintenance and Sales.

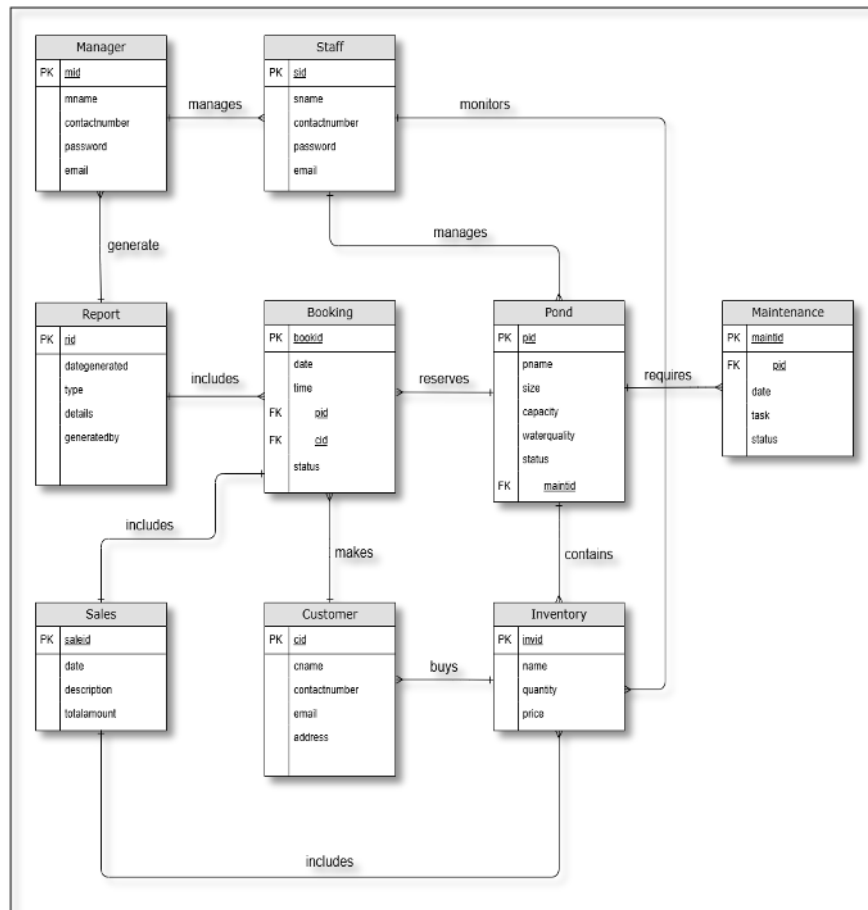


Fig. 4 Entity Relationship Diagram

3.3 Design Phase

This is the third phase of the prototype model, which mainly focuses on the design of the system structure. The database schema and data dictionaries will be designed in this phase. Furthermore, the system architecture and interface design will also be implemented in this phase. This phase is vital as it ensures the structure of the proposed system is logical and relevant. In addition, this phase is a guideline for the future development of the proposed system so that the objectives of this project will always be on track. Therefore, this phase aims to develop a well-defined and strong foundation that matches the project objectives.

3.3.1 System Architecture

The architecture is structured to allow users to use portable computer systems, desktop computer systems, and mobile phones as web browsers to access the system. In the client approach, almost all the processing work was done on demand at the server end, and the client's task was to display data and information on the screen. In a thin client-server architecture, the web browser is the client. This architecture was used because, with it, users will not be required to install any software on their PCs except a standard web browser, which often comes with most PC operating systems and almost all the current standard mobile phones.

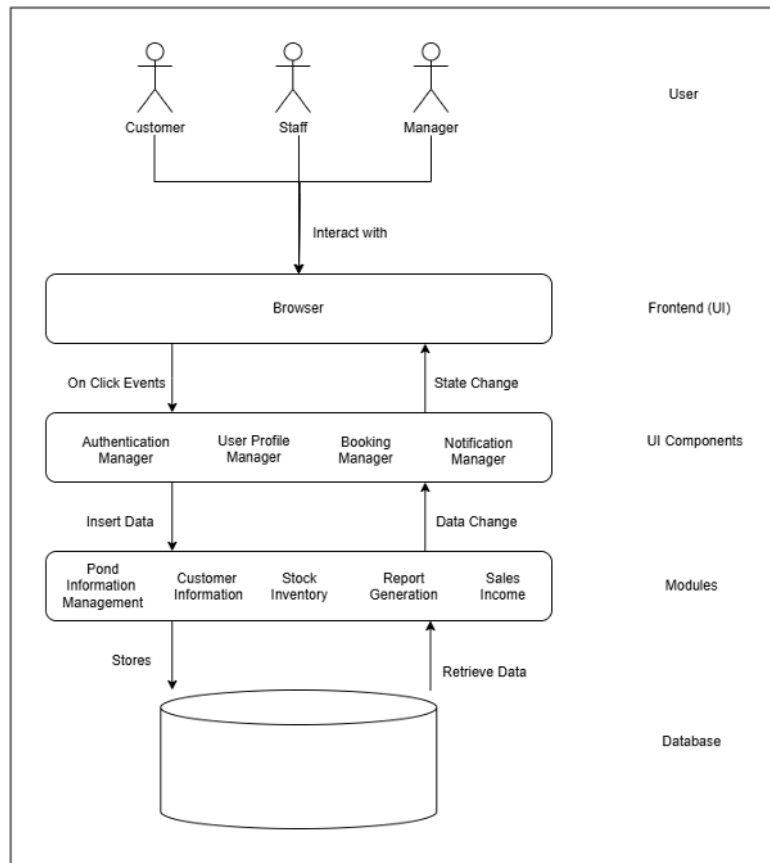


Fig. 5 System Architecture Diagram

3.3.2 Database Design

The schema table provided in the following shows the database design of the proposed system.

- i. Customer (cid, cname, password, contactnumber, email , address)
- ii. Staff (sid, sname, password, contactnumber, email)
- iii. Manager (mid, mname, password, contactnumber, email)
- iv. Pond (pid, pname, size, capacity, waterquality, status, maintid)
- v. Inventory (invid, name, quantity, price)
- vi. Booking (bookid, date, time, pid, cid, status)
- vii. Maintenance (maintid, pid, date, task, status, description)
- viii. Report (rid, dategenerated, type, details, generatedby)
- ix. Sales (saleid, date , quantity, totalamount)

3.3.3 Interface Design

This section demonstrates the user interface design of the proposed system. The user interface designs will show the layout of the system interface that users will interact with. Figure 6(a) – Figure 6(f) illustrates the design.

Browser address bar: www.url.com

FISHING POND MANAGEMENT SYSTEM

Login

Email

Password

Register now if you don't have account

(a)

Browser address bar: www.url.com

FISHING POND MANAGEMENT SYSTEM

Register

Username

Email

Password

(b)

Browser address bar: www.url.com

FPM Log Out

Staff

List of Ponds

ID	Name	Size	Capacity	Water Quality	Status	Action
1	Red Triangle Pond	1 acre	500	Good	Active	Edit / Remove
2	Star-shaped Pond	1 acre	500	Good	Active	Edit / Remove

Dashboard

Pond

Customer Profile

Bookings

Stock Inventory

Maintenance

Report

Sales Income

(c)

Browser address bar: www.url.com

FPM Log Out

Staff

Maintenance

ID	PondID	Date	Task	Status	Action
1	1	15-10-24	Pond Cleaning	Completed	Edit / Remove
2	2	17-10-24	Water Quality Check	Not Completed	Edit / Remove

Dashboard

Pond

Customer Profile

Bookings

Stock Inventory

Maintenance

Report

Sales Income

(d)

Browser address bar: www.url.com

FPM Log Out

Staff

Customer Profile

ID	Name	Phone Number	Email	Address	Action
1	Muhammad Asyraf	011-1234567	muhammad.asyraf@gmail.com	12345 Street, Kuala Lumpur	Edit / Remove
2	Ahmad Ali	012-7654321	ahmad.ali@gmail.com	67890 Street, Kuala Lumpur	Edit / Remove

Dashboard

Pond

Customer Profile

Bookings

Stock Inventory

Maintenance

Report

Sales Income

(e)

Browser address bar: www.url.com

FPM Log Out

Staff

Booking History

ID	Staff	Customer	Date	Time	Status	Action
1	1	1	16-10-24	9:00:00 AM	Confirmed	Edit / Remove
2	2	2	16-10-24	10:00:00 AM	Confirmed	Edit / Remove

Dashboard

Pond

Customer Profile

Bookings

Stock Inventory

Maintenance

Report

Sales Income

(f)

Fig. 6 Interface Design (a) Login Interface Design; (b) Register Interface Design; (c) Pond Information Management Interface Design; (d) Maintenance Interface Design; (e) Customer Profile Interface Design; (f) Bookings Interface Design

4. Implementation and Testing

The Fishing Pond Management System was built as a web-based application with PHP and MySQL, following the prototyping model to ensure iterative improvement and alignment with user needs. The system includes modules for booking management, inventory control, report generation, and a user-friendly interface tailored to pond managers, staff, and consumers. Critical functions include real-time inventory updates, customer booking history, and automatic maintenance work scheduling. The backend uses MySQL for safe data storage and administration, while the frontend uses responsive web technologies for cross-device accessibility. The application significantly lowers human mistakes, simplifies processes, and delivers actionable insights for decision-making, resulting in increased productivity and customer satisfaction.

4.1 System Implementation

The implementation phase is the process of building the entire Fishing Pond Management System. For websites, HTML, CSS, JavaScript and PHP programming languages will be used for coding. Then, the software used is XAMPP. XAMPP is a distributor that provides servers and database modules. The integrated development environment software used is Microsoft Visual Studio.

Figure 7 shows the interface of the login page. The users (customers, staff and managers) have to log in first to access the system. They need an email and a password.

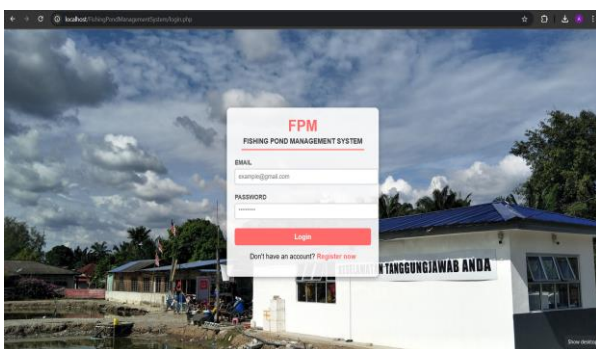


Fig. 7 Login User Interface

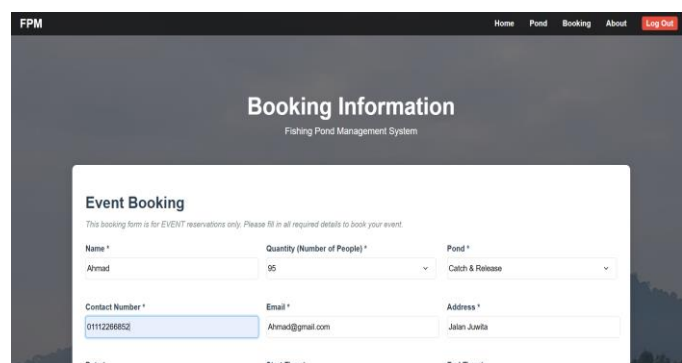


Fig. 8 Customer Booking User Interface

On the other hand, Figure 8 demonstrates the booking modules, which are an important function in the system. The customers can easily make a booking for the event through the Booking Homepage Interface. The interface includes a form where users may enter information such as their name, number of people, phone number, email, and address. After completing the form, a Booking Confirmation section displays the entered information, including the event date and time. Users can then confirm the booking or cancel.

Figure 9 and 10, meanwhile, show the ponds management and its facility. The staff can access a list of existing ponds, which includes information such as name, size, capacity, water quality, and status. To create a new pond, staff utilise the "Add Pond" page, and the data displays in the "View Pond" section after selecting "Create Pond".

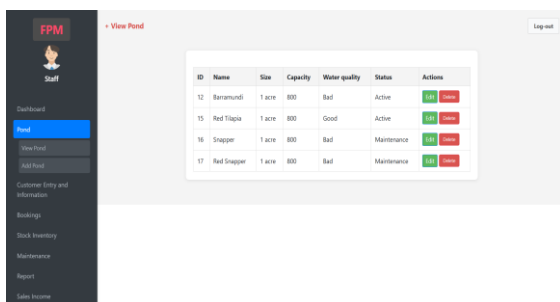


Fig. 9 View Pond User Interface

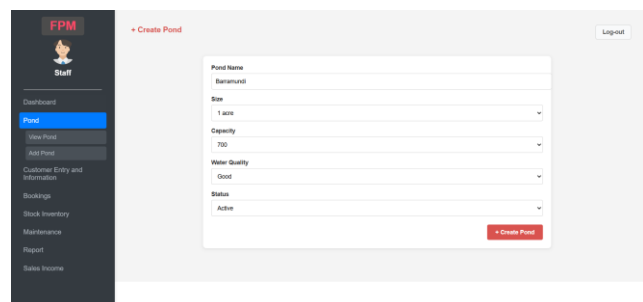


Fig. 10 Add Pond User Interface

The customer profile interface is shown in Figures 11. It explains the Customer Profile Interface, which includes customer viewing and creating operations. This interface provides information on entry users, fishing rod, bait and fish sales. The Add Customer form allows staff to enter new customer information, including necessary elements like phone number and quantity. Staff can use the Edit and Delete button under the "Action" column to modify or remove entries.

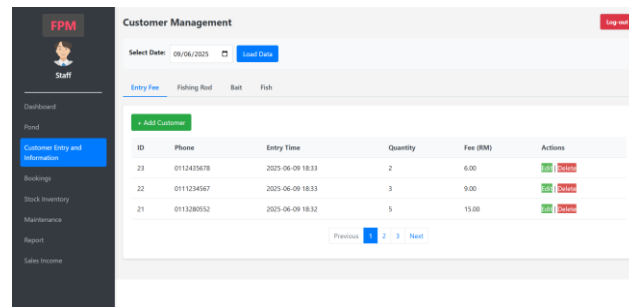


Fig. 11 Customer User Interface

Figures 12 and 13 explain the figures linked to the Bookings User Interface. The interface has two primary sections which is "View Bookings" that displays a table of existing bookings with details like date, time, contact information, and status (e.g., "Confirmed," "Pending," or "Rejected"), and "Create Booking", a form for adding new bookings with fields for customer name, number of people, contact details, and booking schedule.

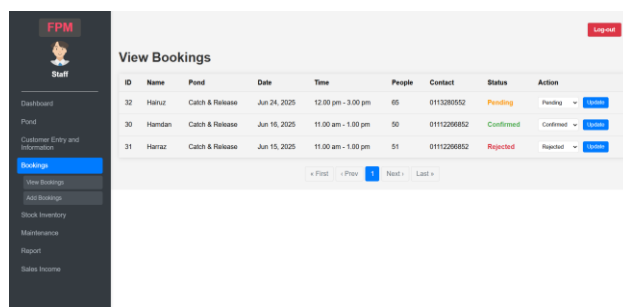


Fig. 12 View Bookings User Interface

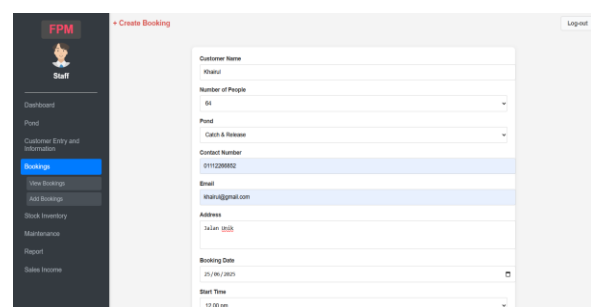


Fig. 13 Add Bookings User Interface

Figures 14 to 15 demonstrate all of the Stock Inventory interfaces. The interface contains sections for View Fish Stock and View Rental Stock, which display inventory data such as item names, quantities, suppliers, and pricing (RM). However, the staff can add fish or rental items at the right corner of the page, and they can edit and delete the information given by clicking the "Edit" or "Delete" button.

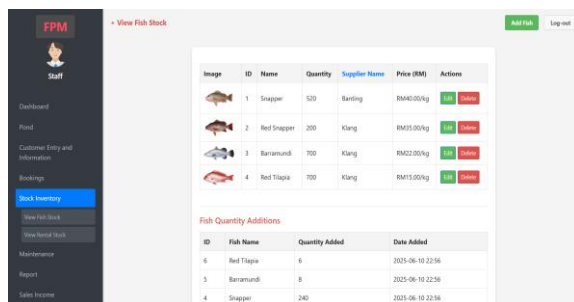


Fig. 14 View Fish Stock User Interface

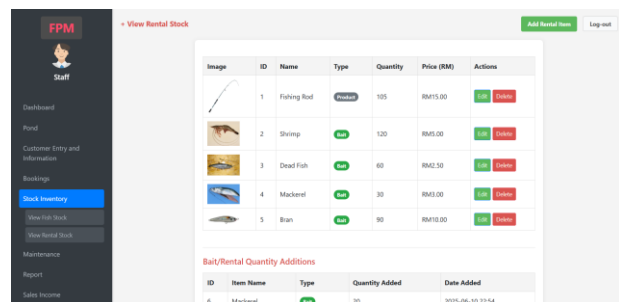


Fig. 15 View Rental/Bait Stock User Interface

Figure 16 describes all figures linked to the Maintenance Interface. This website is the staff task management centre, where the staff receive and track assignments from the manager. The interface shows tasks in a tabular manner, with columns for ID, Pond Name, Task Description, Date, Status (such as "Complete" or "In Progress"), and Action. The streamlined design allows staff to efficiently view and update task statuses.

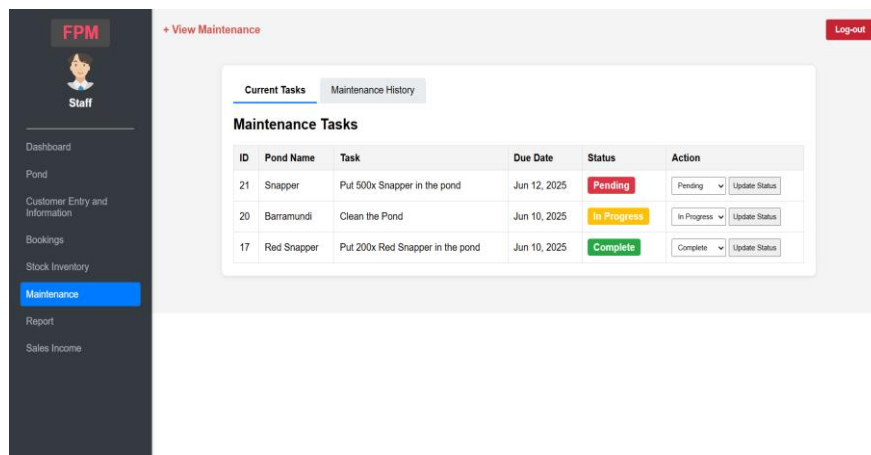


Fig. 16 Maintenance User Interface

Figures 17 and 18 illustrate all the figures associated with the FPM system's Report User Interface. This module offers comprehensive reporting options, allowing staff to export numerous data types (pond information, customer bookings, maintenance records, and sales/inventory reports) in a PDF format. When staff select PDF export (such as for pond data), the system immediately creates a prepared document including the desired information, such as the presented pond details (Name, Size, Capacity, Status) on an organised table.

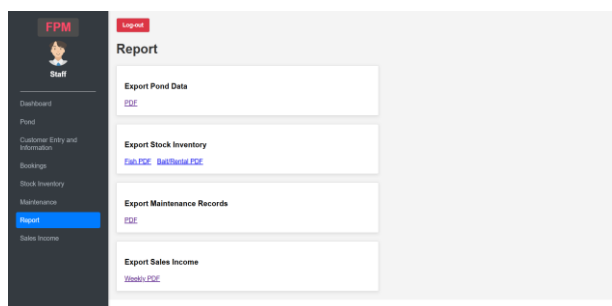


Fig. 17 Report User Interface

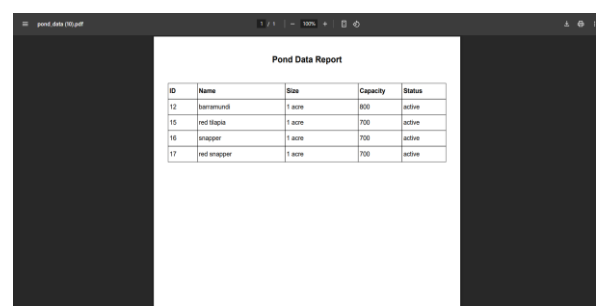


Fig. 18 PDF interface

Sales Income User Interface is shown in Figure 19 in the FPM system. This module gives a thorough financial overview by automatically calculating and showing monthly sales statistics for the specified period (June 2025 in this case). The interface has three main sections, which are a summary dashboard displaying categorized revenues. Next, a visual trend chart comparing revenue sources.

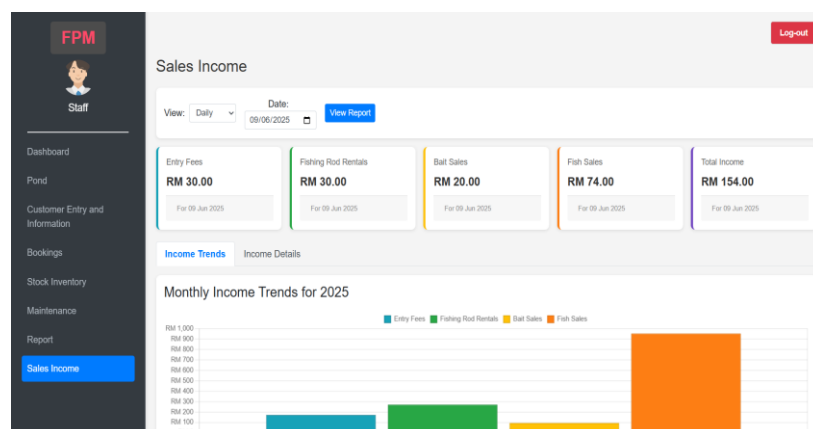


Fig. 19 Sales Income User interface

Figure 20 shows the Manager Maintenance Interface, which allows managers to assign and track maintenance tasks to the staff. The interface has a task creation form and a tracking table that displays task information, status ("Complete"/"In Progress"), and historical data.

Fig. 20 Manager Maintenance User interface

4.2 System Testing

System testing is a crucial stage in a software development lifecycle, assessing the entire integrated system's compliance with specified requirements. It evaluates the system's functionality, performance and reliability in real-world conditions, ensuring all components in the system work and interact. This system testing enhances the product quality and customer satisfaction by ensuring robustness and readiness for deployment.

Functional testing is a sort of software testing in which the software system is evaluated against functional requirements. Each function of the module will be tested during functional testing by providing an appropriate value, determining the output, and comparing the actual output with the expected value. As a result, functional testing was undertaken to ensure that the Fishing Pond Management System corresponds to the functional requirements.

Table 3 List of Test Cases

Module	Test Case ID	Description	Expected Result
Account Registration and Login	M1-1	To check whether the customer can register for an account	The user can create an account
	M1-2	To check whether an administrator can log in to the system	The user can log in to the system
	M1-3	To check whether the system will restrict login whenever a wrong credential is entered	The system should restrict login when incorrect credentials have been entered
Customer Booking	CBOOK_01	Submit the booking form with valid data	The system accepts input and displays a confirmation page with all entered details.
	CBOOK_02	Verify the Booking Confirmation section.	All entered fields match the submitted form.
	CBOOK_03	Click the Confirm Booking button.	The system can save the booking.
	CBOOK_04	Click the Cancel button.	The system does not save the booking.
	CBOOK_05	Submit the form with the missing required fields	The system rejects the submission and prompts the user to fill in the required fields.
Pond Information Management	POND_01	Add a new pond	Pond is added successfully and appears in the list
	POND_02	Display all ponds	All ponds are displayed correctly
	POND_03	Remove a pond	The pond is removed successfully from the list
	POND_04	View pond details	Pond details are displayed correctly
	POND_05	Edit pond details	Pond details are updated successfully

Table 3 (cont)

Module	Test Case ID	Description	Expected Result
Customer Profile	CUST_01	Add a new customer profile	The customer profile is added successfully and appears in the list
	CUST_02	Display all customer profiles	All customer profiles are displayed correctly
	CUST_03	Remove a customer profile	The customer profile is removed successfully from the list
	CUST_04	View customer profile details	Customer profile details are displayed correctly
	CUST_05	Edit customer profile details	Customer profile details are updated successfully
Bookings	SBOOK_01	View existing bookings in the "View Bookings" table.	All bookings are displayed with correct details.
	SBOOK_02	Submit a new booking via the "Create Booking" form with valid data	Booking is saved; appears in "View Bookings" with "Pending" status.
	SBOOK_03	Confirm a booking via "View Bookings."	Status changes to "Confirmed," and the WhatsApp notification link is generated.
	SBOOK_04	Reject a booking via "View Bookings."	Status changes to "Rejected", and the WhatsApp notification link is generated.
	SBOOK_05	Submit "Create Booking" with missing required fields	The system rejects the submission and prompts the user to complete the fields.
Stock Inventory	STOCK_01	View fish stock data	All fish stock items are displayed correctly on the table.
	STOCK_02	Add a new fish stock item via the "Add Fish" button.	The item appears in the "View Fish Stock" table with correct details.
	STOCK_03	Edit an existing rental item	Changes are reflected in the "View Rental Stock" table.
	STOCK_04	Delete an entry fee record via "Delete" button.	Record is removed from the "View Entry Fees" table.
	STOCK_05	Attempt to add stock with invalid data	System rejects input; prompts user to correct values.
Maintenance	SMAIN_01	View assigned maintenance tasks in the task table.	All tasks are displayed with correct details.
	SMAIN_02	Update a task status from "Pending" to "In Progress."	Status changes in the table
	SMAIN_03	Update a task status from "In Progress" to "Complete."	Status changes in the table, and the task is marked as done.

Table 3 (cont)

Module	Test Case ID	Description	Expected Result
Report	SREP_01	Export the pond information report	PDF is generated with data in a structured table format.
	SREP_02	Export customer bookings report to PDF.	The PDF includes all booking records with proper columns.
	SREP_03	Export maintenance records report to PDF.	PDF displays maintenance history with task outcomes.
	SREP_04	Export sales/inventory report to PDF.	PDF summarizes sales and stock data with totals.
	SREP_05	Attempt to export a report with no data	The system displays the message: "No data available for selected filters."
Sales Income	SSALES_01	Verify summary dashboard displays the correct total revenue	The dashboard shows the accurate sum of all categorized revenues
	SSALES_02	Validate the trend chart that compares revenue sources	The chart renders correct labels and proportional values for each category
	SSALES_03	Check the transaction records list for customer-specific details	All transactions appear with no missing/duplicate entries
	SSALES_04	Filter transactions by date range	Only transactions within the selected period are displayed.
	SSALES_05	Test empty data scenario	Dashboard shows RM 0; chart and records display "No data available."
Manager Maintenance	MMAIN_01	Create a new maintenance task via the task creation form.	The task is saved and appears in the tracking table with "Pending" status.
	MMAIN_02	Assign a task to a staff.	The task is linked to the staff and appears in their task list.
Manager Report	SREP_01	Export the pond information report	PDF is generated with data in a structured table format.
	MREP_02	Export customer bookings report to PDF.	The PDF includes all booking records with proper columns.
	SREP_03	Export maintenance records report to PDF.	PDF displays maintenance history with task outcomes.
	MREP_04	Export sales/inventory report to PDF.	PDF summarizes sales and stock data with totals.
	MREP_05	Attempt to export a report with no data	The system displays the message: "No data available for selected filters."
Manager Sales Income	SSALES_01	Verify summary dashboard displays the correct total revenue	The dashboard shows the accurate sum of all categorized revenues
	SSALES_02	Validate the trend chart that compares revenue sources	The chart renders correct labels and proportional values for each category
	SSALES_03	Check the transaction records list for customer-specific details	All transactions appear with no missing/duplicate entries
	SSALES_04	Filter transactions by date range	Only transactions within the selected period are displayed.
	SSALES_05	Test empty data scenario	Dashboard shows RM 0; chart and records display "No data available."

The system has been developed successfully. The implementation and testing phase have been essential to make sure the developed solution works as intended. To find and fix any problems, this phase entailed not only programming the system but also thoroughly testing it. We have made sure that every part works together seamlessly, and extensive testing has confirmed the system's functionality, dependability, and user happiness.

Early resolution of possible issues has improved the system's overall quality and guaranteed that it satisfies all requirements, which has eventually resulted in a successful deployment.

5. Conclusion

The Fishing Pond Management System created for this project solves the issues encountered by Kampung Ayer Tawar Fishing Pond by automating manual activities such as booking administration, inventory tracking, and report production. By moving from paper-based records to a web-based system, the initiative lowers human error and increases operational efficiency. The technology offers real-time data access, allowing pond managers to make more informed decisions about fish stocking, maintenance, and customer service. This digital revolution improves accuracy and streamlines everyday processes, resulting in better management of the fishing pond. Overall, the system is a contemporary solution designed to meet the unique requirements of small to medium-sized fishing pond enterprises.

One of the Fishing Pond Management System's primary assets is its user-friendly interface, which is intended to appeal to both staff and customers. The technology makes processes like bookings, updating inventory, and creating financial reports easier to understand, especially for those with minimal technical knowledge. Furthermore, the modular architecture facilitates scalability, allowing for future additions such as mobile application integration and IoT-based monitoring. The system's capacity to centralise data provides consistency and dependability, minimising the inefficiencies associated with scattered handwritten records. These qualities, when combined, help the fishing pond run more efficiently and profitably.

The project's relevance goes beyond operational efficiency, as it provides long-term advantages for customer satisfaction and corporate success. By digitising reservations and delivering real-time information on pond conditions, the solution improves the customer experience and encourages return visits. The linked sales and inventory modules improve financial tracking, allowing managers to optimise resources and maximise profits. Furthermore, the system's data analytics capabilities give significant information about client preferences and operational trends. These characteristics position the fishing pond for long-term expansion and competition in the recreational fishing business.

Finally, the Fishing Pond Management System effectively modernises Kampung Ayer Tawar Fishing Pond operations by automating and digitally integrating key pain points. While there is a need for improvement, such as mobile accessibility and offline functioning, the system's existing features are extremely beneficial to both managers and customers. Future innovations, like as AI-driven analytics and IoT integration, have the potential to further improve its capabilities. This initiative emphasises the role of technology in altering traditional organisations, opening the way for more efficient and customer-focused management methods. The system acts as an example for comparable small businesses looking to adopt digital solutions.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

*The authors confirm contribution to the paper as follows: **study conception and design:** Muhammad Ashraf Dzulfahmi, Nureize Arbaiy; **data collection:** Muhammad Ashraf Dzulfahmi, Nureize Arbaiy; **analysis and interpretation of results:** Muhammad Ashraf Dzulfahmi, Nureize Arbaiy; **draft manuscript preparation:** Muhammad Ashraf Dzulfahmi. All authors reviewed the results and approved the final version of the manuscript.*

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