



Fisheries Logbook & Analytic System

**A dissertation submitted for the Degree of Master of
Information Technology**

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Declaration

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge it does not contain any material published or written by another person, except as acknowledged in the text.

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ABSTRACT

Fisheries industry is one of the main income resources of Sri Lanka which affords a considerable portion of food needs of the country. As well as the fisheries data is a very important resource which should be maintained and used in order to improve the fisheries industry through accurate decisions.

Daily catch data is collected from multiday boats of Sri Lanka regularly. The Department of Fisheries and Aquatic Resources (DFAR) collect this data and generate reports in a manual process. Different users are involved in the process for data entering and report generation. The efficiency and effectiveness of the process are at a low level due to the manual methods.

Due to the lack of an analytic system, the DFAR couldn't get the complete advantage of the collected data. Currently, the data is not analysed or used for decision making in an effective way.

Through this project, a web-based system (Fisheries Logbook & Analytic System) is proposed and developed with the aim of making the storing, processing, and analyzing of daily catch data of multiday boats more efficient and effective. Fish catch data can be stored and retrieved for supporting the decision-making process through an accurate analytic system. Accordingly, the system used the web-based architecture to facilitate different user levels to access the system concurrently.

It is concluded that the developed system can increase the efficiency and effectiveness of the process and it can support the decision-making process in an accurate way.

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LIST OF ABBREVIATIONS

DFAR	:	Department of Fisheries and Aquatic Resources
Admin	:	Administrator
DA	:	Data Analyst
FI	:	Fisheries Inspector

Chapter 1 : Introduction

1.1.Statement of the Problem

A paper-based logbook system is used for collecting daily catch data of multiday boats of Sri Lanka. The daily catch data for a fishing trip is filled by the skippers manually, in the form issued by the harbor unit of the Department of Fisheries and Aquatic Resources (DFAR).

Including the details of the boat, fishing gears and trip details, the skippers manually enter daily catch data with the quantity and the location. Skippers handover these log sheets to the staff of harbor units of the DFAR at the end of every fishing trip. The staff of harbor units then submit the data sheets to the DFAR head office after checking the form data. Once they are submitted, data entering process is begun.

Currently, a proper system for data entering and storing doesn't exist at the DFAR. They use a spreadsheet application which has limited facilities and a complex front end. Because of this complexity, the DFAR staff face difficulties in handling data as they have to work with large datasets collected from multiday boats.

At the same time, the report generation has become a difficult task, because of the unfriendliness of the process. As the DFAR staff has to generate a number of different types of reports, they have to go through a complex process manually generate those reports. Following are the reports which the department needs to generate using the daily catch data.

1. District wise data
 - a. No of high sea vessels
 - b. No of EEZ (Exclusive Economic one) vessels
 - c. Contribution for the fish production – Monthly, quarterly, annually
2. Species wise Fish production by vessel, Monthly and yearly
3. Species wise Fish production by Gear, Monthly and yearly
4. Species wise Fish production by longitude and latitudes (defined grid), Monthly and yearly

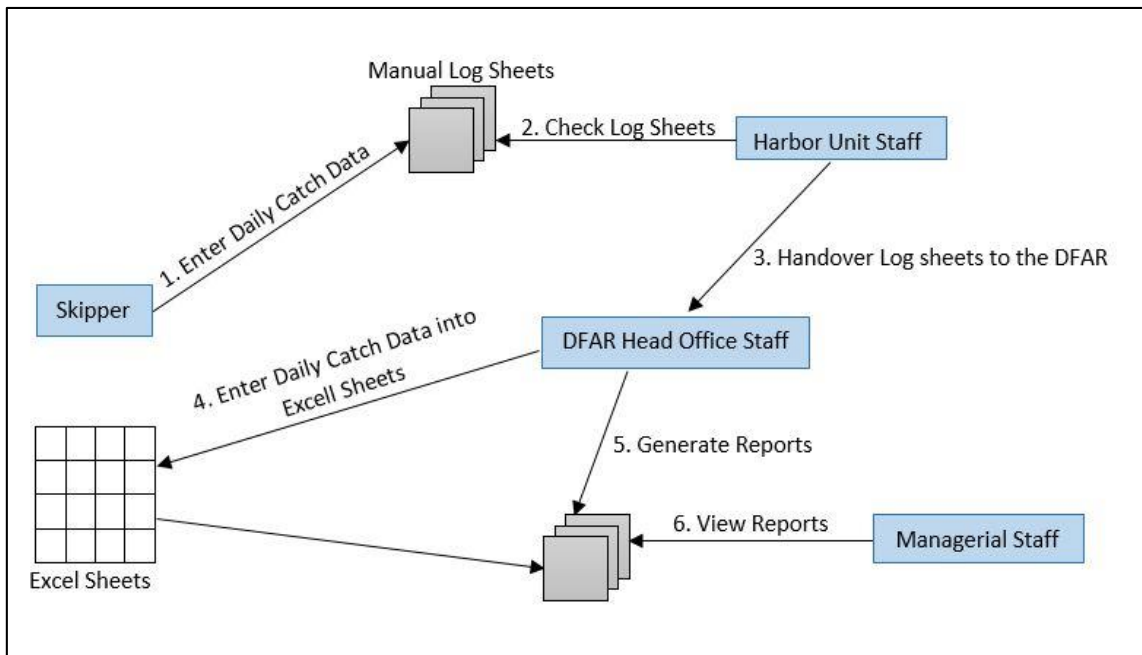


Figure 1.1.1 Existing System at the DFAR

1.2. Proposed System

As a solution for the manual process which is carried out with the above-mentioned difficulties, the new system; Fisheries Logbook & Analytic System (FLAS) has been proposed. There, the fisheries inspectors, admin staff, managerial staff, and data analysts will interact with the system in order to complete the data entering, system backend managing, and the report generation and data analyzing processes respectively.

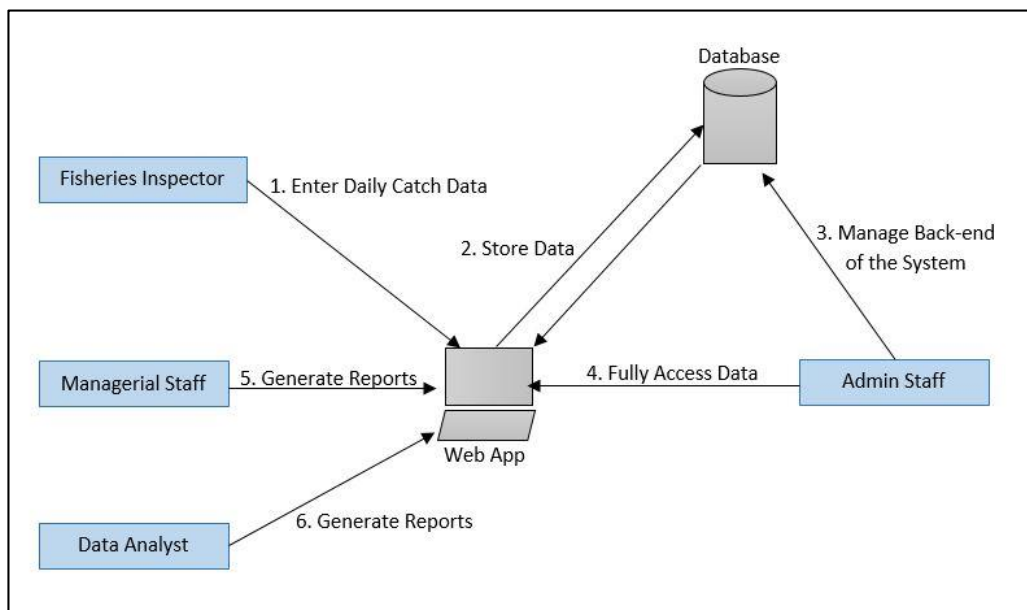


Figure 1.2.1: Proposed System

1.3. Motivation

A system which doesn't include an analytic system was proposed by the DFAR. But non-existence of an analytic system is a weakness as a large amount of catch data is collected daily. Through an analytic system, it will be easier for the managerial staff to identify patterns, make predictions, and decisions in order to improve the productivity and the efficiency of the fisheries industry.

Accordingly, by considering about the previously discussed difficulties which occurred because of the complexity and the inefficiencies of the manual process, I was motivated to solve them through a system with a centralized database and analytic system. So, the effective data storing and processing will make the whole process effective. And then analyzing which leads to new opportunities through predictions will be accurate and improve the fish production of Sri Lanka.

1.4. Aim & Objectives

Following are the aim and the objectives of the project.

1.4.1. Aim of the Project

The aim of this project is to make the storing, processing and analyzing of daily catch data of multiday boats more efficient and effective.

1.4.2. Objectives

- Give multiple access to data through a web-based system in order to improve data access for the staff of different levels at the DFAR.
- Process data for generating reports in order to support the decision-making process.
- Visualize data in order to identify patterns for making predictions.
- Reduce cost and manpower for data analytic process.
- Increase the accuracy of the data analyzing process.
- Increase the efficiency of the process through effective and simple User Interfaces.

1.5.Scope

1.5.1. In Scope:

- A web-based system will be developed with a centralized database. The system is limited to the staff members at DFAR.
- Effective User Interface design.
- Data entering, processing and analyzing is done through the system.
- Currently collected all data categories through paper-based logbooks will be included in the new system.
- Analytic System (Data visualization and analyzing process) along with the Logbook will be developed.

1.5.2. Out of Scope:

- Mobile Application for real-time data entering by the skippers –
The mobile app will be developed by the DFAR. Once the mobile app is developed, it will be plugged into the web-based system. But this will not be covered during this project period.
- Registration of Boats, Owner, Fishing gears, Equipment and facilities are not done through the system.
- Issuing Fishing gears, and Equipment and facilities for the boats do not handle by this system.

Chapter 2 : Background

2.1. Background

The Department of Fisheries and Aquatic Resources (DFAR) collects daily catch data of multiday boats of Sri Lanka. The data is collected daily in each fishing trip and then generate reports. Accordingly, daily catch data such as quantity, fishing gears used, and location along with the fish species from all the registered multiday boats are collected. At the beginning of the year, the DFAR issues a logbook for each multiday boat which is registered under the Ministry of Fisheries & Aquatic Resources of Sri Lanka. The "Fishing Logbook" [Figure 2.1.1] is used for one-time data entry of a boat for a year. In this form, the information about the boat, boat owners, and the fishing gears are included. Then the "Daily catch data for a fishing trip" [Figure 2.1.2] is used by the skippers to enter the catch data. Skippers handovers the manually completed data sheets to the DFAR harbor units at the end of the fishing trip and the harbor units submit them to the DFAR head office. Once they are submitted, the DFAR staff begins to enter the data of the manually filled forms into excel sheets. Then data processing and report generation are done.

Department of Fisheries and Aquatic Resources Sri Lanka		FISHING LOGBOOK - ඩිවර දත්ත සටහන් පොත		LOGBOOK No.	Date of Issue/නිකුත් කල දිනය
Information of the Boat - යානය පිළිබඳ විස්තර				Information of the Owner/Owners - අයිතිකරු/අයිතිකරුවන් පිළිබඳ විස්තර	
Local Boat Registration No. දෘශ්‍යමය යානය				Name අයිතිකරුගේ නම	
Name of the Vessel යානයේ නම				Address ලිපිනය	
IMO No. / IMO අංකය				National ID No. ජාතික හැඳුනුම්පත් අංකය	
IOTC Registration No. IOTC, දෘශ්‍යමය යානය				Telephone No. දුරකථන අංකය	
Fishing Operation License No. අවසානවී සලකා දෙනා				Mobile No. මිලිනිකුරු අංකය	
High Seas flag අවසානවී සලකා දෙනා				Home ජාතික අංකය	
Length of the Boat (ft.) යානයේ දිග (අඩි)				Radio call sign දුරකථන අංකය	
Gross Tonnage (MT) ග්‍රහණය (මෙට්‍රික් ටන්)				Number of Crew ලැබිය යුතු සංඛ්‍යාව	
Information of Fishing Gears - ඩිවර ආමසන්න පිළිබඳ විස්තර					
Long line gear configuration - මරුවැල් ආමසන්නය					
Trotline / Handline - දිගු සන්නය/අත් දොන් සන්නය					
Main line material ඉහළම සන්නය					
Thick Rope / ඉඳිමහන කඳු					
Thin Rope / සාමාන්‍ය ඉඳිමහන කඳු					
Nylon Braided / නයිලන් බ්‍රැයිඩ් කඳු					
Nylon Monofilament / නයිලන්					
Branch line Material ඉහළම සන්නය					
Nylon / නයිලන්/නයිලන්					
Other / අනෙක්					
Average float line length (ft) / සාමාන්‍ය ඉහළම කඳු (අඩි)					
Average branch line length (ft) / සාමාන්‍ය ඉහළම කඳු (අඩි)					
Distance between branch line (ft) / සන්නය අතර දුර (අඩි)					
Total bundles/ hooks / මුළු මුදුම් / මුදුම් සංඛ්‍යාව					
Information of Fishing Gears - ඩිවර ආමසන්න පිළිබඳ විස්තර					
Gill net configuration - කරමුල් දැල්					
Net material දැල් තැන්පා					
Nylon braided / නයිලන් බ්‍රැයිඩ්					
Nylon multifilament / නයිලන් බහුමස්					
Other / අනෙක්					
Mesh size (Inches) / දැල් අවකාශ ප්‍රමාණය (අඟුල්)					
Ply of the Net / දැල් අඟුල් ගණන					
Height of the Net (ft) / දැල් උස (අඩි)					
Length of a net piece (ft) / දැල් කපුකුඩා දිග (අඩි)					
Number of net pieces / දැල් කපුකුඩා ගණන					
(Maximum Length 2.5km / අධිකම දැල් දිග 2.5 කි.මී.)					
Information of Fishing Gears - ඩිවර ආමසන්න පිළිබඳ විස්තර					
Purse seine and Others - හැමිලි දැල් සහ අනෙක් ඩිවර ආමසන්න					
Signature and Stamp of the Authorized Officer (Fisheries Inspector/FRMA/ Harbour Manager)					
Length of the Ring Net / Purse Seine (m) හැමිලි දැල් දිග (මීටර)					
Height of the Ring Net / Purse Seine (m) හැමිලි දැල් උස (මීටර)					
Type of FADs used භාවිතයට ගන්නා ඉහළම කඳු වර්ගය					
Total Number of FADs ඉහළම කඳු සංඛ්‍යාව					
Date දිනය					
Equipments and Facilities - උපකරණ සහ පහසුකම් (Tick appropriate box at right - අදාළ පහසුකම් මත ලකුණක් දෙන්න)					
Communication set සන්නය සහ පහසුකම්					
SSB Radio ඉහළම කඳු					
VMS/Transponders විකල්ප සන්නය					
Compass / මැදුරුව					
GPS ඉහළම කඳු					
Fish hold / ඉහළම කඳු අඟුල් කපුකුඩා					
Fish Finder Sonar ඉහළම කඳු					
Freezer Unit/මුහුණත ඉවත්කරගන්නා ඒකකය					
Net Hauler / දැල් අඟුල් කපුකුඩා					
Line Hauler / දැල් අඟුල් කපුකුඩා					
Ice Hold / අධික ඉහළම කඳු					
Remarks - අනෙක්					
Signature and Stamp of the Assistant Director දිනය					
Date දිනය					

Figure 2.1.1: Data Entry form for Manage Boats, Owners, Fishing Gears, and Equipment & Facilities

2.2. Review of Similar Systems

Even though fisheries industry in Sri Lanka currently uses manual logbooks and conducting manual report generation process, there are various similar type of systems in the world, related to fisheries industry. Those systems are a reviewed in this section.

2.2.1. vCatch

vCatch is an integrated application for electronic logbooks [1]. This tool is designed and developed with a powerful database to be used by fisheries authorities for catch effort registration. With vCatch, the process of manual typing and re-typing of data are eliminated. vCatch consists of the following two modules:

- Module on board the fishing vessel
- Module at the authority

They can be used separately or together while it benefits all stakeholders with a unique ease of use.

2.2.2. vCheck

vCheck is a tool for the use of fisheries authorities to ensure a timely and accurate use of quota data [2]. The system is best explained as a graphical drill-down of data and it will allow the authority to be on top of all the vast amounts of data that indicate the quota usage. There are two main purposes of the vCheck system as follows:

- Give the authorities an overview of the year-to-date uptake of all quotas in order to avoid overfishing.
- Give the authorities an overview of the year-to-date uptake of all quotas in order to make sure that the industry spends the quota.

2.2.3. Fisheries Logbook System (FLS)

The Fisheries Logbook System (FLS) is used to records the fishing and non-fishing activity of fishermen who are required to report their fishing activity via logbooks submitted for each trip [3]. The need for more and better quality data on how the marine resources are utilized is increased as the conservation of marine resources are increased. And one of the most useful types of data is catch per unit effort. There are two types of reporting forms as follows:

- The form which is used for the pelagic longline fisheries.
- The logbook form which used to report catch and effort data for the Gulf reef fish, South Atlantic snapper-grouper, coastal shark and king and Spanish mackerel fisheries.

2.2.4. Fishery Analyst Online Version 3.0

Fishery Analyst Online version 3.0 is a web GIS application aiming to effectively query fishery data, analyze and visualize temporal and spatial patterns of fishery dynamics [4],[5]. The application can easily read any type of geo-referenced fishery data. The user can search and select data in the system using a rich query interface based on criteria such as region, event, date, caught species, and gear or catch characteristics. Collected data is displayed in table format and plotted in bar or pie charts.

Chapter 3 : System Requirements Analysis

3.1.Method used for Requirements Gathering and Analysis

First, the existing system was analyzed. Here, the user identification, use cases identification was done and use case diagrams, and activity diagrams were used in this stage. Then having a clear understanding of the existing process, the proposed system requirements are analyzed using the previously mentioned diagrams and PACT analysis.

3.3.Requirements Gathering

Requirements gathering was done through client interviews and meetings. Few meetings were conducted in order to collect the real requirement of the system. The DFAR had already proposed a system and the details of that system was provided to me during the meetings. At the same time, they come up with the requirement of developing an analytic system for DFAR. After several discussions about these things, it was decided to integrate the new requirement of developing an analytic system into the already proposed system.

The proposed system has a mobile application for daily catch data entering process and the DFAR had already decided to develop it for them. Therefore, in my project a system will be developed for Data entering and managing, analyzing, and report generation. Once the mobile app is developed by the DFAR, it will be plugged into the system.

3.4.Requirement Analysis

Before analysis, the requirement of the proposed system existing system was analyzed to get an understanding of the domain and the system.

3.4.1. Analysis of the Existing System (Manual System)

In requirements analysis phase, the existing system was analyzed first as it is impossible to develop a new system as a replacement of a manual system, without having a clear idea about it. Accordingly, once the functions and the users were identified, a use case diagram was designed to identify the interaction.

3.4.1.1. Functions of the Existing System

There are only limited functions in the current process. The activity diagrams drawn for the use cases of the existing system are attached in Appendix 1.

- Enter daily catch data into Manual Forms
- Check daily catch data
- Enter daily catch data into Excel Sheets
- Generate and View Report

3.4.1.2. Users of the Existing System

There is only four users involved in the current process and they are listed below.

- Skippers
- Fisheries Inspector (Harbor Unit Staff)
- Administrators (DFAR Head Office Staff)
- Managerial Staff

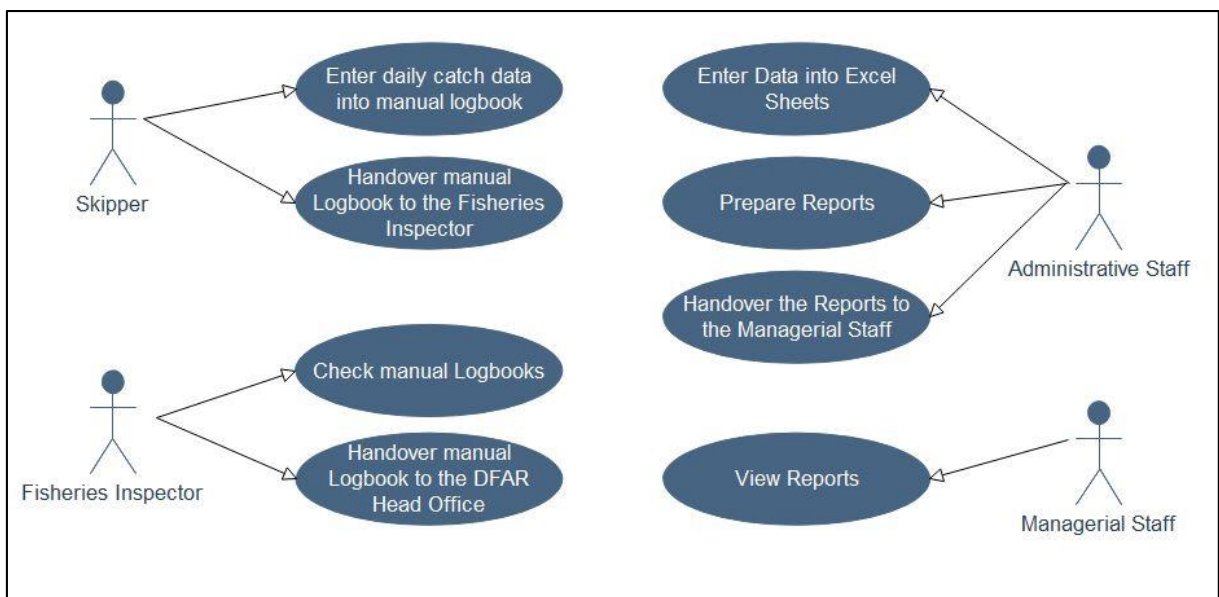


Figure 3.4.1: Use Case Diagram for Existing System

After designing the use case diagram, each use case was considered separately and designed the activity diagrams to identify the way of carrying out each use case. The activity diagrams drawn for the use cases of the existing system are attached in Appendix 1.

3.4.2. Requirements Analysis of the Proposed System

After analyzing the existing system, the requirement analysis of the proposed system was begun. First, the user identification, functional and non-functional requirements identification is done with a PACT (People, Activities, Context, and Technologies) Analysis.

3.4.2.1. User Identification

There four types of users involved in this system, as listed below.

- Administrator
- Fisheries Inspector
- Manager
- Data Analyst

As the current process is done manually, all the users are familiarized with the manual logbook and report generation process. They are completely new for an electronic logbook and analytic system.

3.4.2.1.1. Requirements of the System

The identified requirements of the system are categorized under two major types as Functional Requirements and the Non-functional Requirements.

3.4.2.1.1.1. Functional Requirements

- Manage Boat Details (Add/ Delete/ Update)
- Manage Boat Owner Details (Add/ Delete/ Update)
- Manage Skipper Details (Add/ Delete/ Update)
- Manage Fishing Gear Details (Add/ Delete/ Update)
- Manage Details of Equipment and Facilities (Add/ Delete/ Update)
- Manage Fish Categories (Add/ Delete/ Update)
- Manage Fish Species (Add/ Delete/ Update)
- Enter and View Catch data to the system in order to analyze
- Visualize Data in order to get an idea about the data and to support the data analysis
- Analyze Data in order to make predictions, and generate reports
- Generate and View Reports in order to support the management in decision making

3.4.2.1.1.2. *Non-functional Requirements*

- As the users are not from IT background, the system must be easy to learn and use.
- The interfaces and the functionalities must be designed and developed in a way that it tallies with the mindset of the users
- Easy navigation through the system.
- The accurate data gathering and accurate calculations (analyzing) through the system will be helpful for the management to make accurate predictions and decisions.
- Different user levels will be able to access the data from different locations through the web-based system at any time.

3.4.3. Method used for Requirements Analysis

3.4.3.1. *PACT Analysis*

People	The main users of the system are Administrator, Fisheries Inspector, Manager, and Data Analyst.
	They are less IT literate persons who currently have a completely manual process.
	Their mental model has been developed according to the manual process so that the proposed system must be tally with their mental model.
	A non-eye-sore color scheme will be selected as the users have to work with the system as they are working with large datasets.
	The system must be user-friendly as the users are less IT literate and novice to the technology.
Activities	The overall purpose of the activities is to visualize and analyze data for pattern recognition and decision making.
	The users will carry out the activities frequently.
	They will enter data into the database through the system and retrieve them for analyzing. Accordingly, the users will access a large set of data concurrently.
	Accuracy is an important aspect as the data will be used for pattern recognition and decision making.
	Maintenance of the system needs to be done according to the requirements of the DFAR.

Context	Different users will access the system from different places concurrently.
	Centralization of data is important for multiple access.
	It is required to give training and demonstration to the users as they are completely new to the system.
	Users will be effective and efficient in the process of data entering and analyzing.
Technologies	A large amount of data will be entered into the system which collected from multi-day boats.
	Graphs, charts, tables, and maps will be used for data visualization when analyzing data.
	Reports can be viewed and download in PDF format.
	There must be real-time database update when entering data into the system.
	All logged users can access database with different privileges.
	Graphical User Interfaces with windows, icons, and menus will be used in the system.
	The system will be web-based as multiple users will access the system from different places concurrently.

Table 3.4.1: PACT Analysis

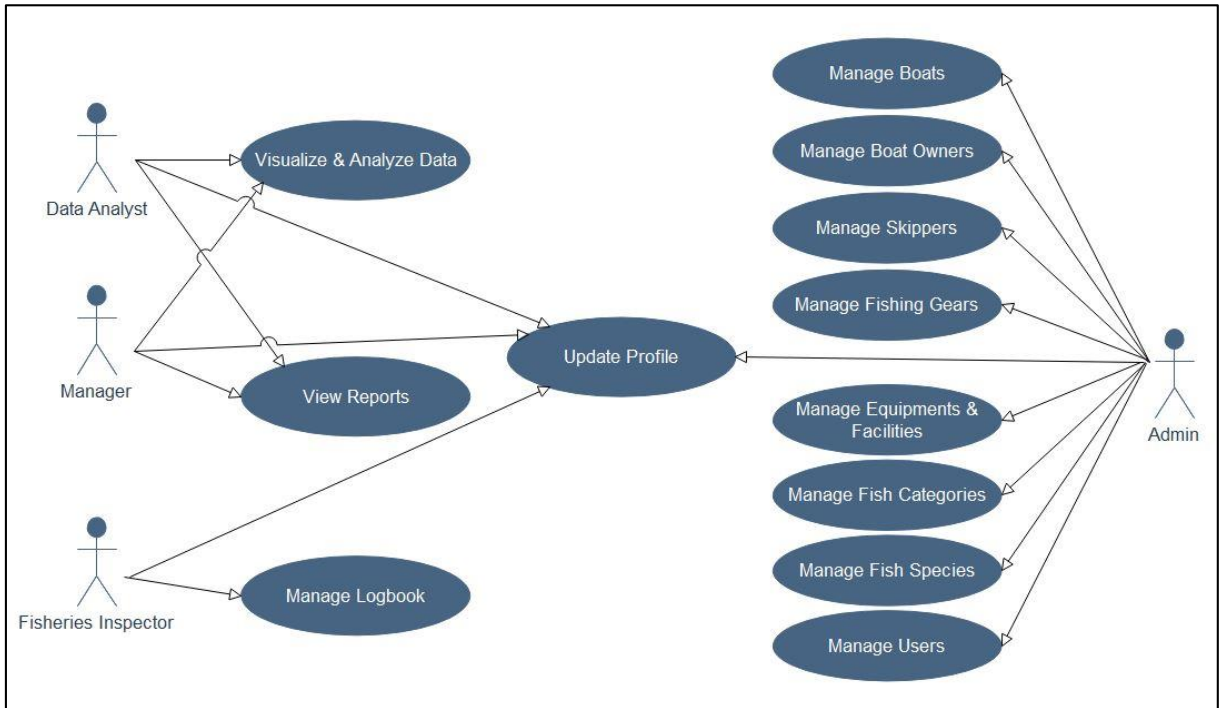


Figure 3.4.2: Use Case Diagram for Proposed System

*Mange refers to Add/ Delete/ Update/

Above diagram shows the high-level use cases of the system. There, daily catch data is entered into the system by Fisheries Inspector. This part will be replaced by plugging the mobile app once it is developed.

Chapter 4 : System Design

4.1. Alternative Design Strategies

This section includes a comparison among the proposed system and the alternative design strategies, through a feasibility study. The aim of this project is to make the storing, processing and analyzing of daily catch data of multiday boats more efficient and effective. So the feasibility study of alternative strategies is carried out with the feature comparison and identified developing a Web-based System as the best strategy.

4.1.1 Alternative 1 (The Solution) – Web based System

Different users will access the data concurrently, from any location and at any time through a web-based system for different purposes such as data entering, analyzing, report generation and etc.

4.1.2 Alternative 2 – Stand Alone System

The effectiveness of the users will not be optimized as some users have to wait idly as they haven't the accessibility to data. And the data will be redundant in several locations as a centralized database is not used. Accordingly, it is not effective to develop a stand-alone system.

4.1.3 Alternative 3 – Mobile Application

Through a mobile application, the catch data can be entered into the system in real time by the skippers. But, when comes to the analyzing process and the report generation, a mobile app is not feasible.

4.2. Design Method

After designing the use case diagram, separate activity diagrams were designed for each use case identified. Then the sequence diagrams were designed and all the interfaces were identified. Using those sequence diagrams, the system architecture and the user interfaces were designed.

4.2.1. Activity Diagrams

Use Case : Manage Boats

Assumption : User Logged into the System

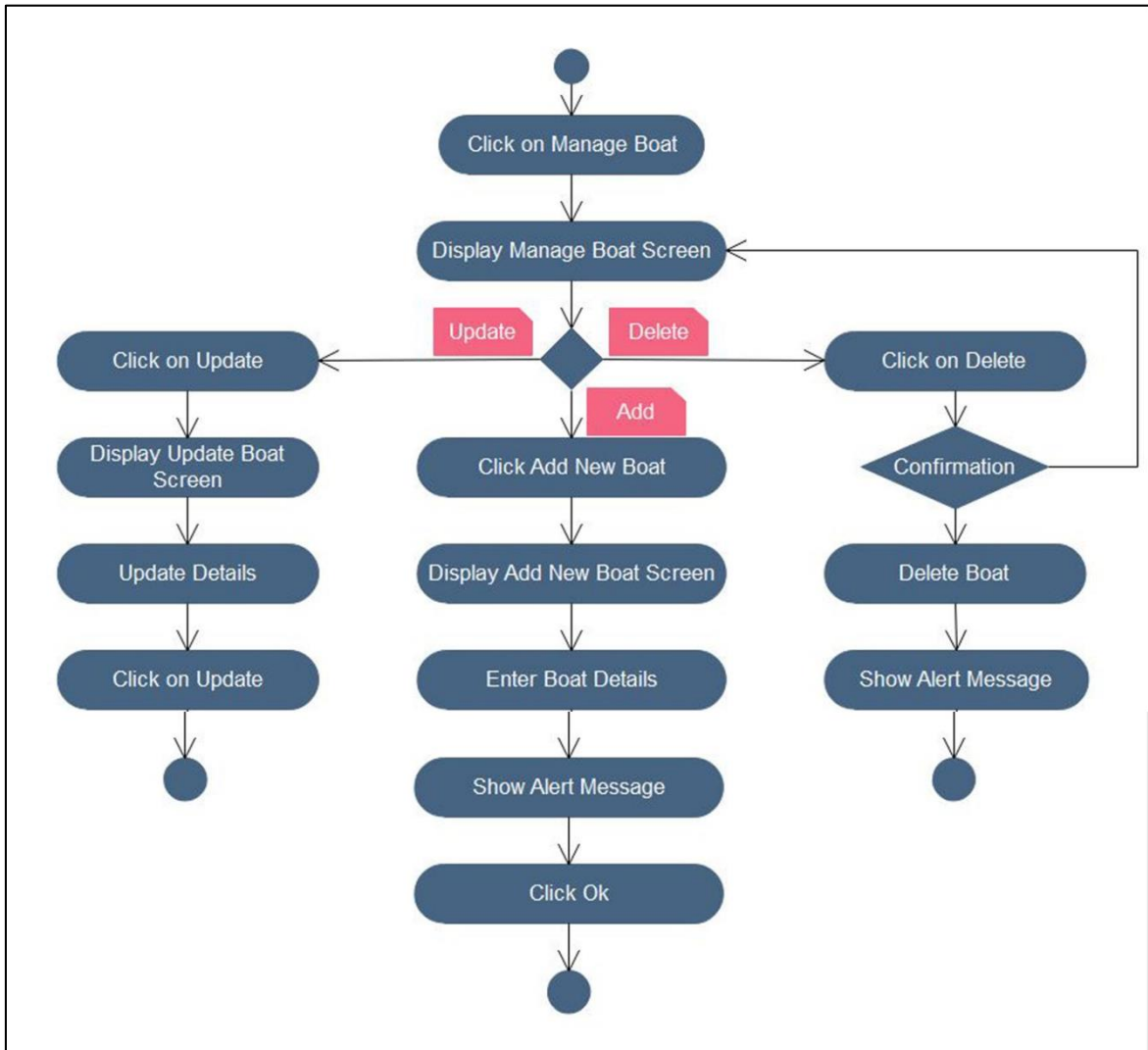


Figure 4.2.1: Activity Diagram for Manage Boats Use Case

* All the “Manage” type of use cases will proceed in the same flow as above.

Use Case : Generate Reports

Assumption : User Logged into the System

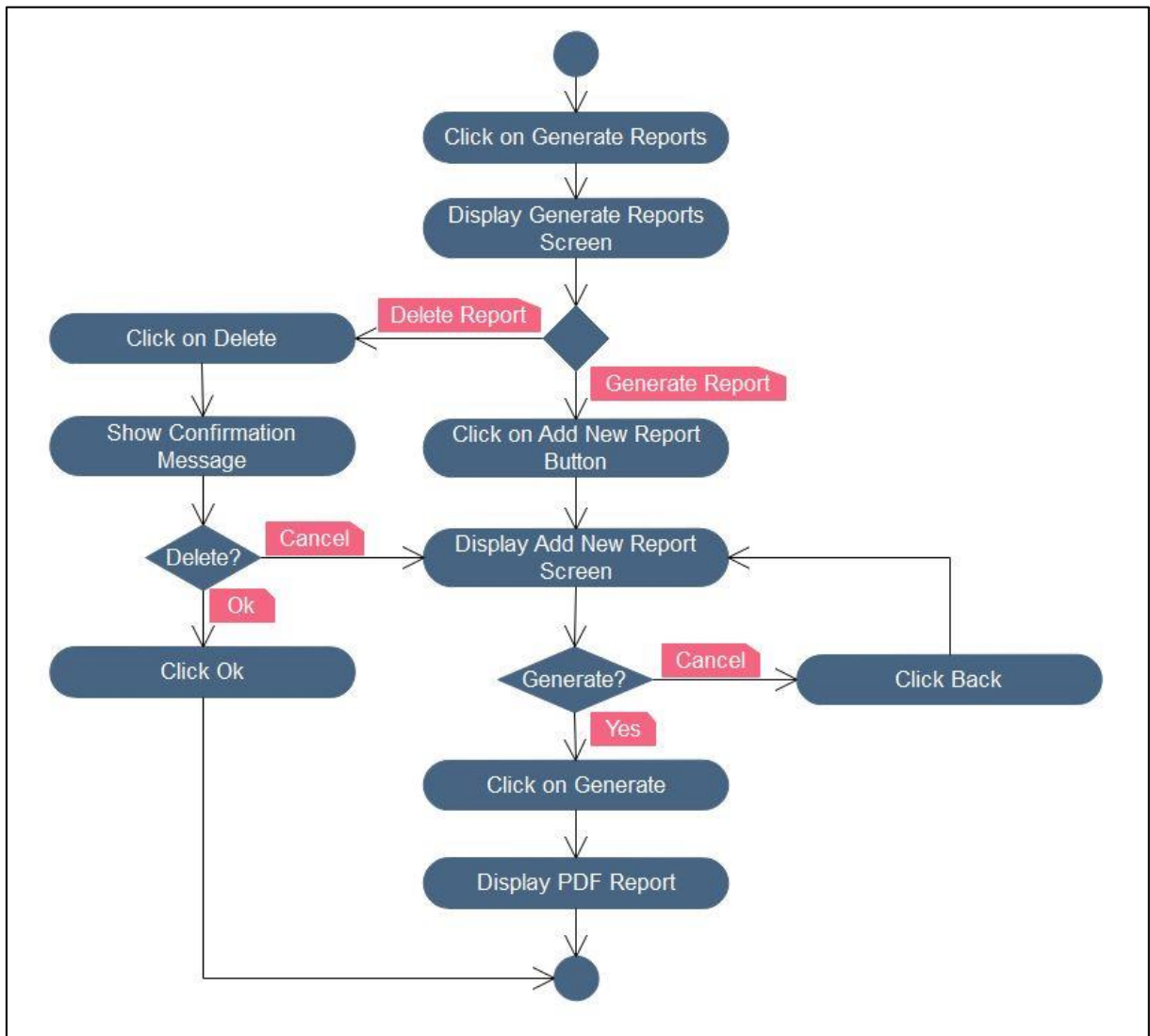


Figure 4.2.2: Activity Diagram for Generate Reports Use Case

Use Case : Manage Logbook

Assumption : User Logged into the System

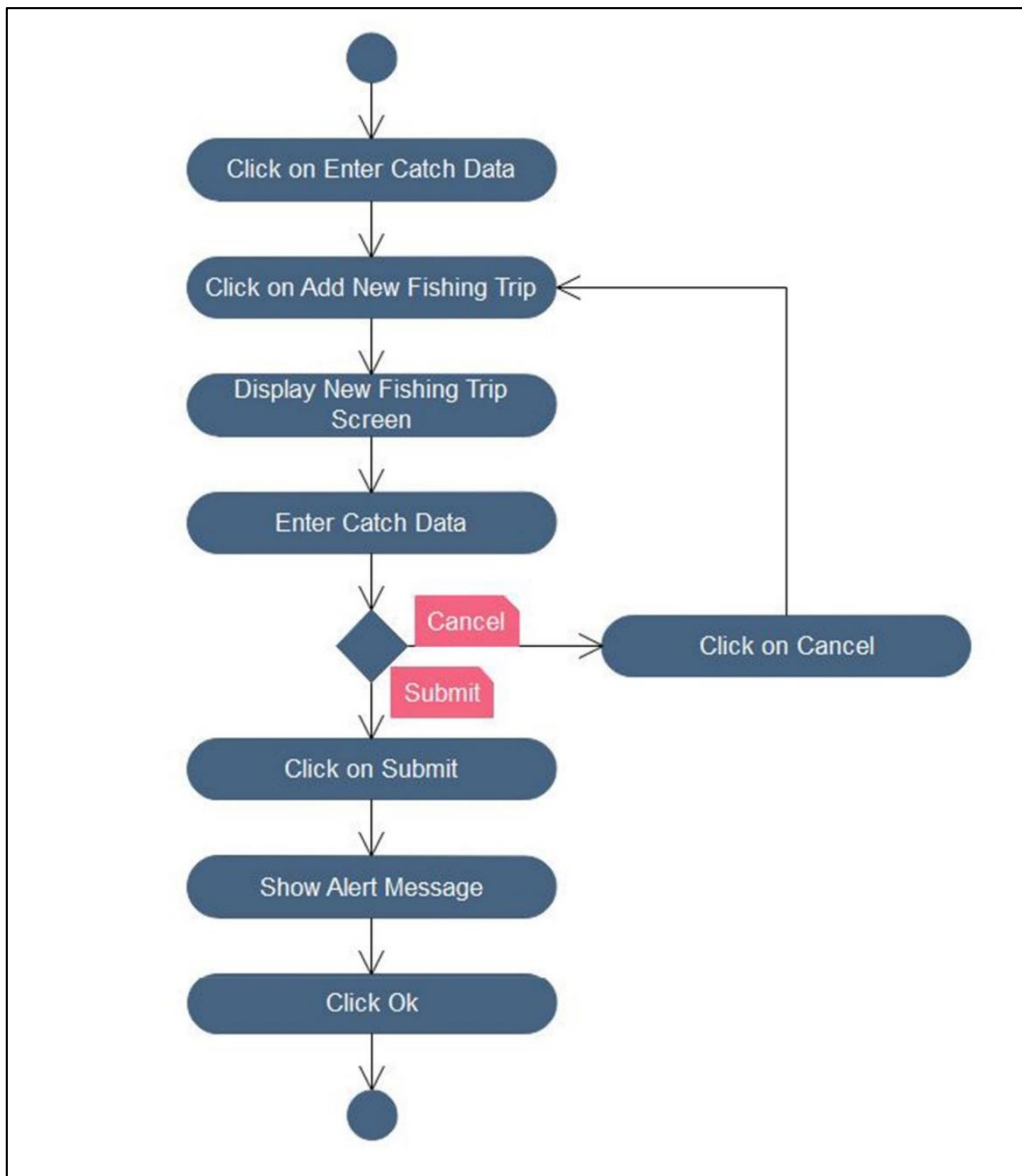


Figure 4.2.3: Activity Diagram for Manage Logbook Use Case

4.2.2. Sequence Diagrams

The sequence and the interaction of the interfaces are identified using sequence diagrams. As the MVC Architecture will be used in developing the system, each module has a Model, View, and Controller. The main controller will be the Login controller as the users will be authenticated to different interfaces based on the user type.

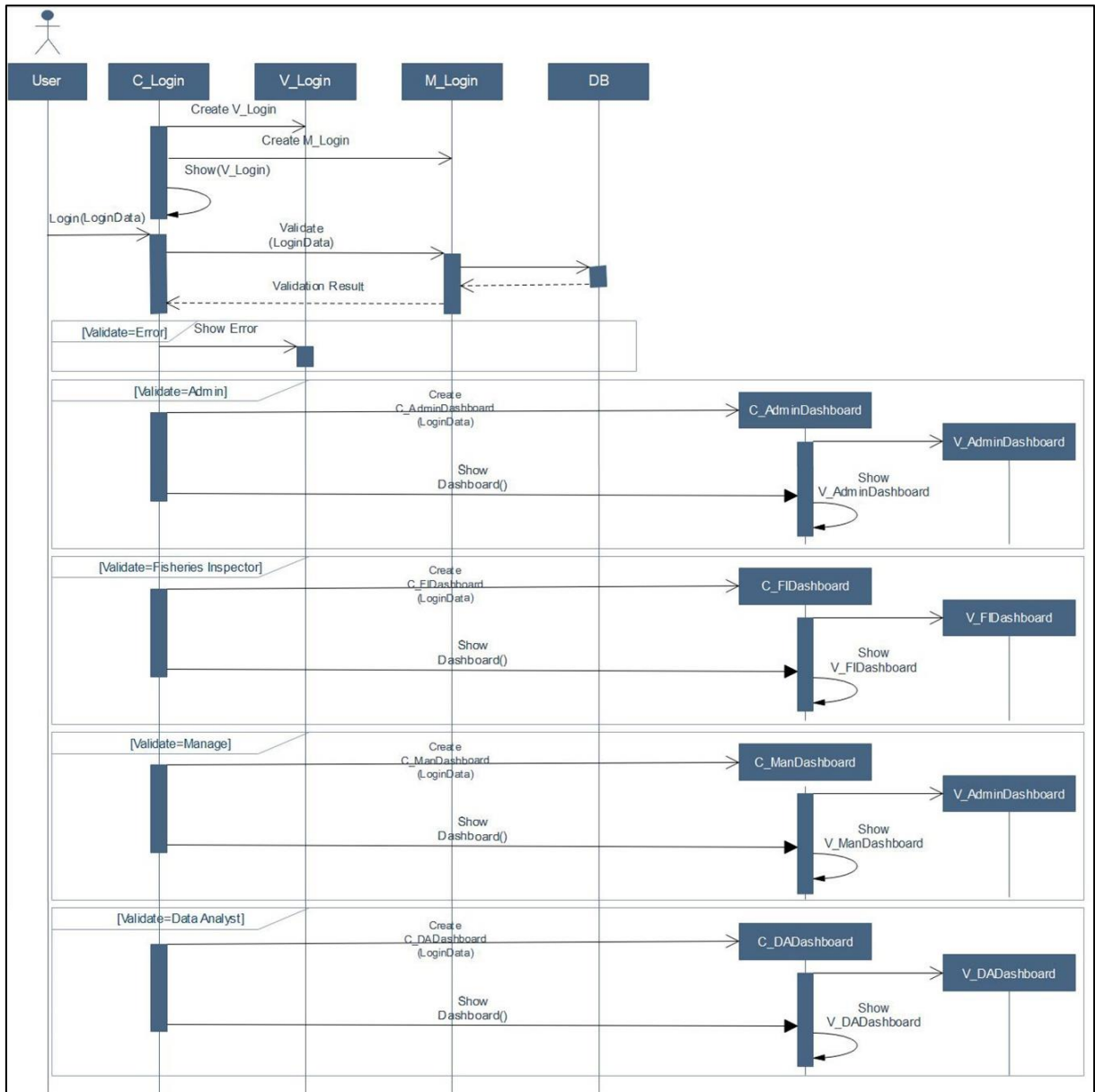


Figure 4.2.4: Sequence Diagram for Login Module

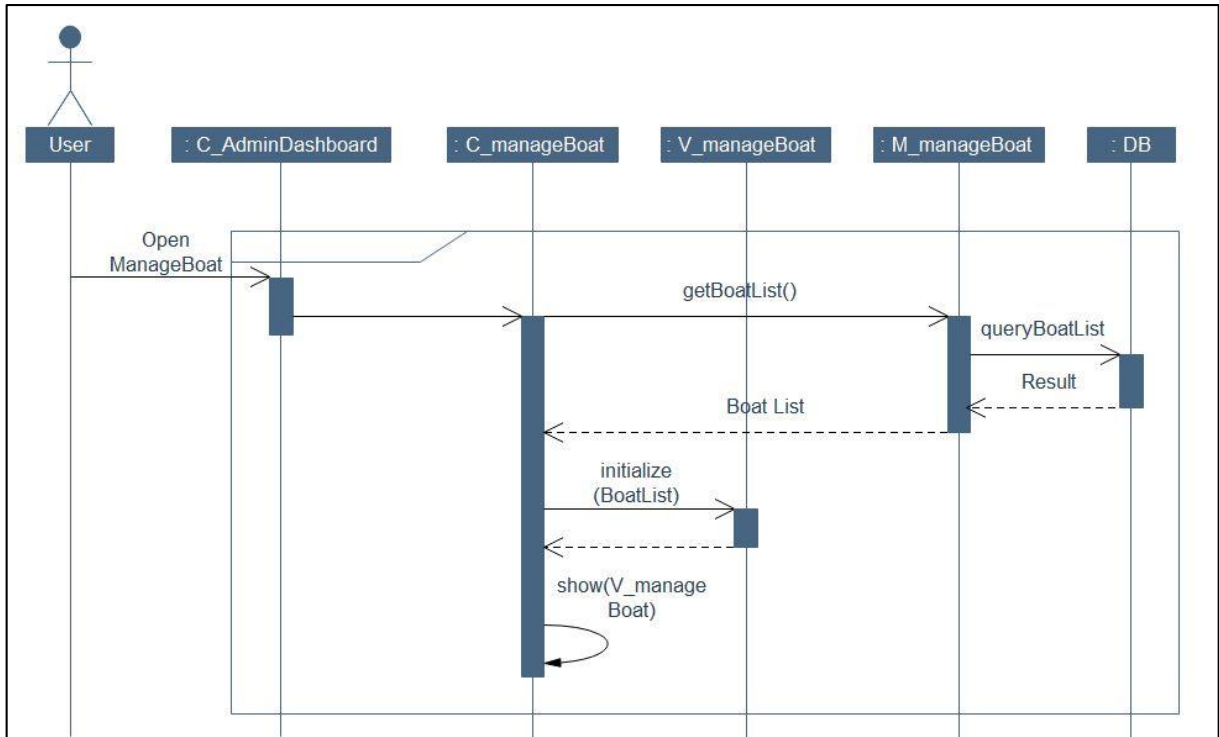


Figure 4.2.5: Sequence Diagram for Opening Boat Screen

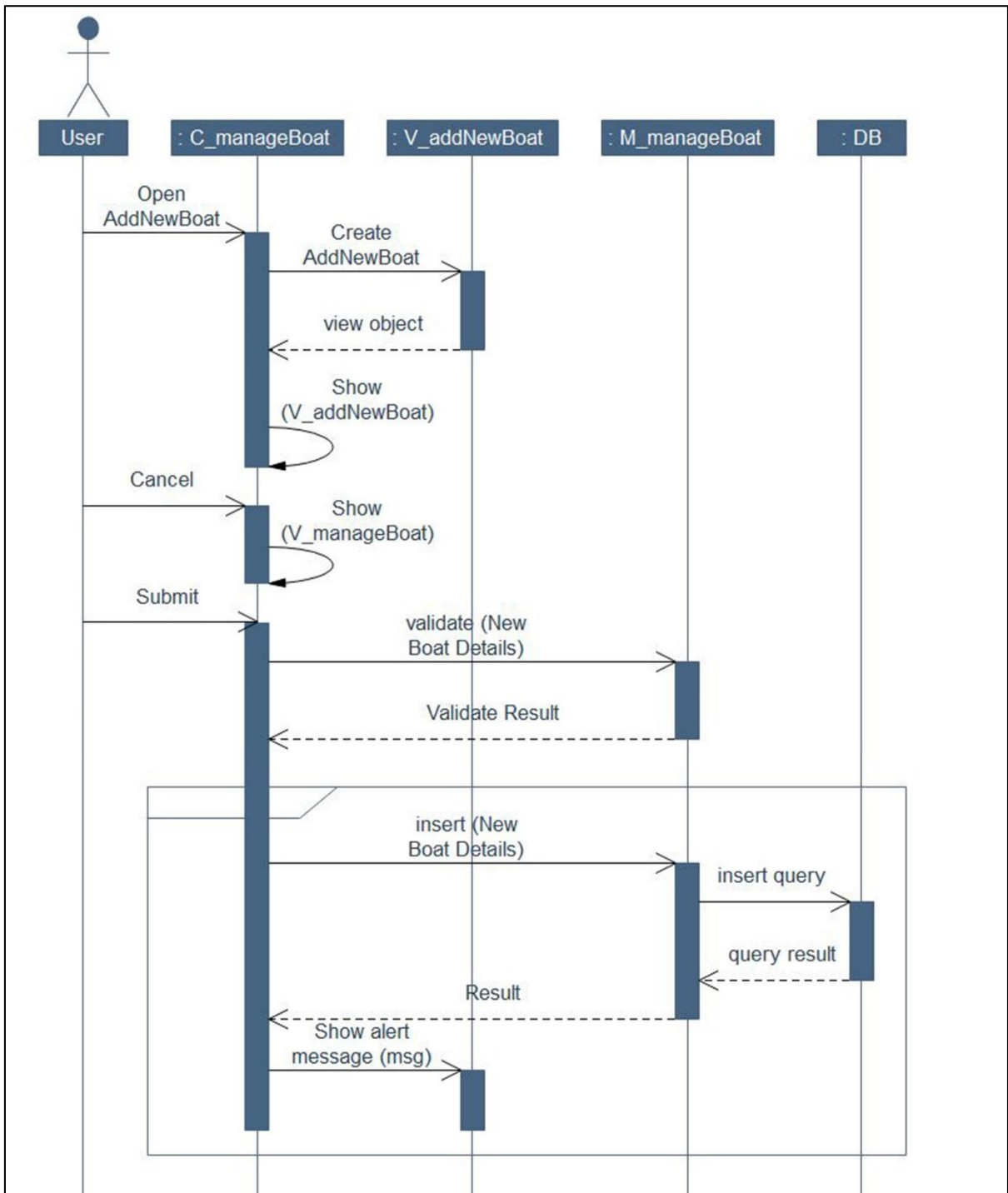


Figure 4.2.6: Sequence Diagram for Add New Boat

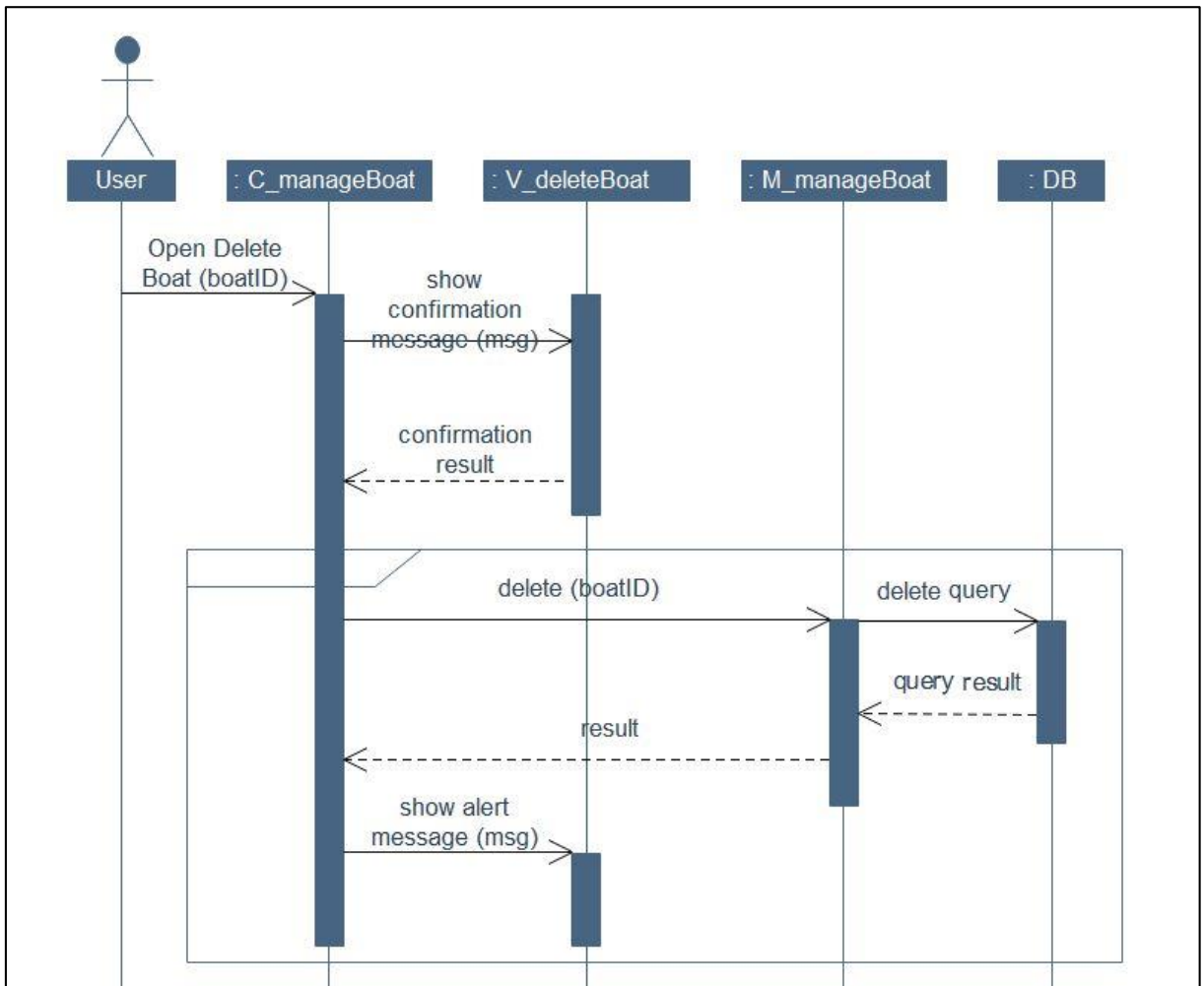


Figure 4.2.7: Sequence Diagram for Delete Boat

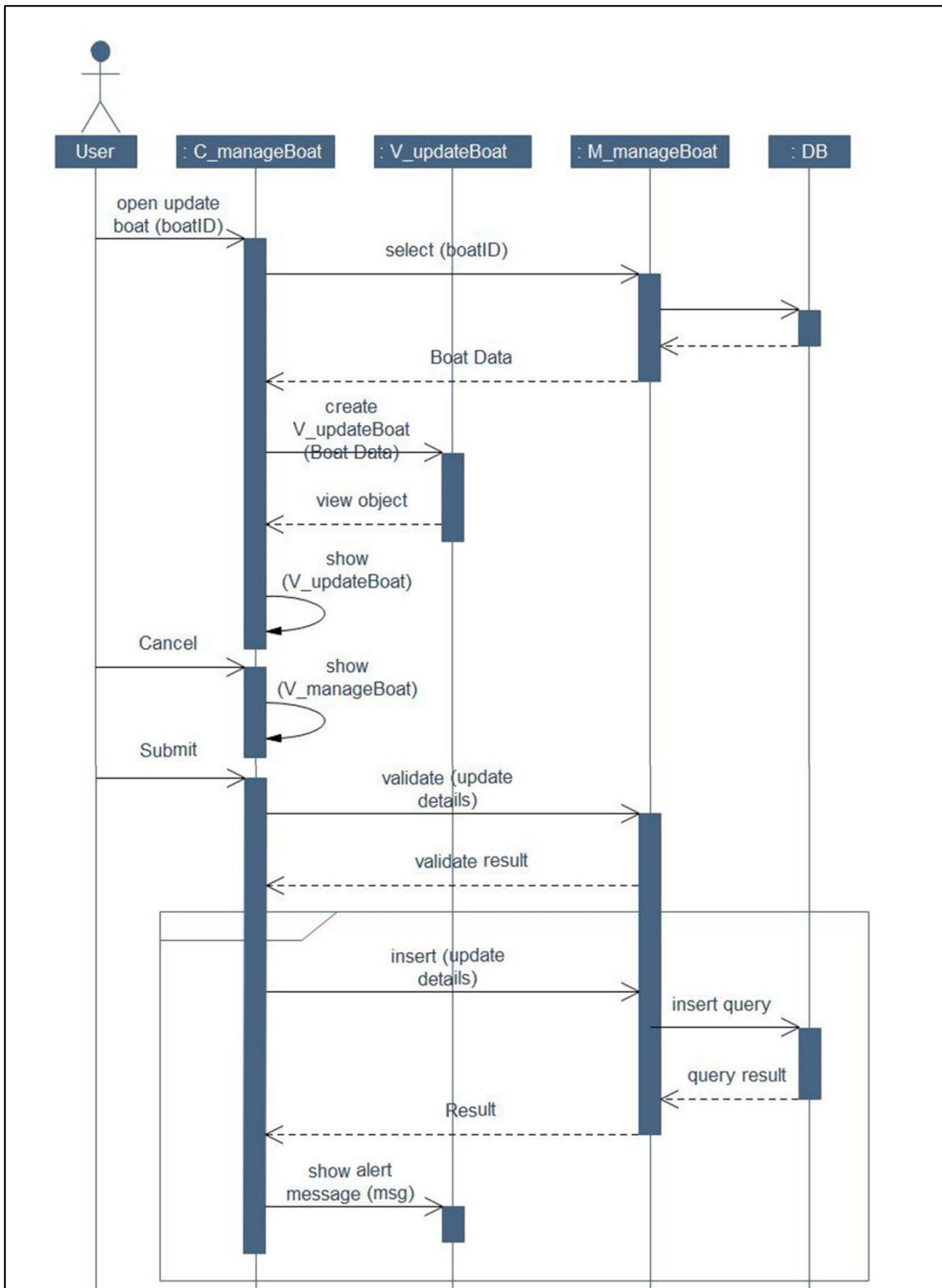


Figure 4.2.8: Sequence Diagram for Update Boat

4.3. Software Architecture

Once the sequence diagrams are designed, a better understanding was gained about the whole system. Accordingly, which user interacts with which interface to complete which goal under which constraints are clearly identified by drawing the sequence diagrams. And those became the base for designing the software architecture. The high-level system architecture is shown in Figure 4.3.1 and the detailed system architecture is attached in Appendix 2.

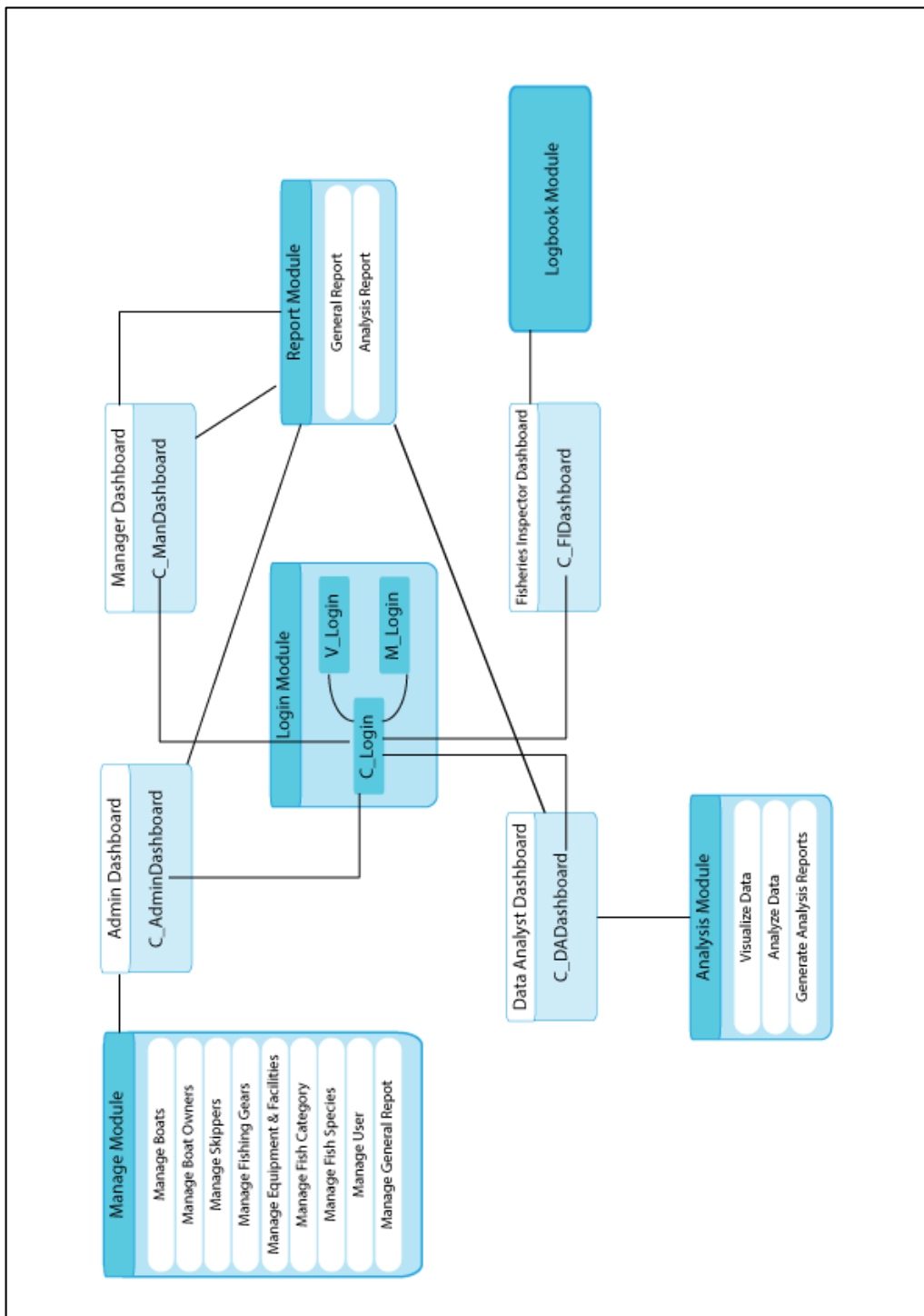


Figure 4.3.1: High Level System Architecture

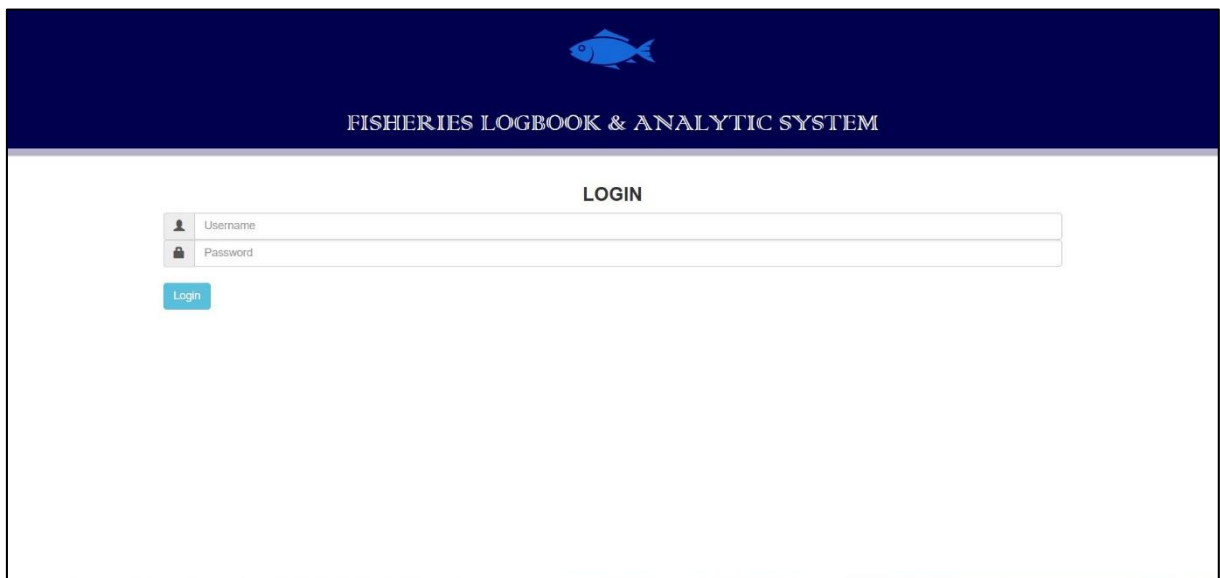
4.3.1. Modules of the System

There are mainly five modules in this system. And each module has different controllers, views, and models related to them. The controllers will control the processing according to the user actions and it will be the communicator between the user interface and the database. The modules are listed below.

- Login Module
- Manage Module
- Logbook Module
- Report Module
- Analysis Module

4.3.1.1 Login Module

Login Module is the main module of the system. When any user load the system URL the login page will be displayed. When the user tries to log into the system using his/her credentials, the Login Module will verify the user through the username, password combination and the user type. After the verification, according to the user type, the user will be redirect to the relevant dashboard; Admin Dashboard, FI Dashboard, Manager Dashboard or Data Analyst Dashboard. Each Dashboard is connected to the Login controller through their own controllers.



The screenshot shows the login interface for the 'FISHERIES LOGBOOK & ANALYTIC SYSTEM'. The header is dark blue with a fish icon and the system name. The main content area is white and contains a 'LOGIN' section. This section has two input fields: 'Username' (with a person icon) and 'Password' (with a lock icon). Below these fields is a blue 'Login' button.

Figure 4.3.2 Login Interface

```

1  <?php
2  defined('BASEPATH') OR exit('No direct script access allowed');
3
4  class C_login extends CI_Controller {
5
6      public function index()
7      {
8          $this->LoadLoginPage();
9      }
10
11     private function LoadLoginPage()
12     {
13
14         $this->load->model('M_login');
15
16         // $this->load->model('M_GeneratePDF');
17
18         $data['pageTitle'] = 'Login Page'; // $this->M_login->getData();
19
20         $data['signButtonText'] = 'Sign in';
21
22         $data['userData'] = '';
23
24         if($this->input->post()) // login attempted?
25         {
26             $username = $this->input->post('username');
27             if(!empty($username)) // username not empty
28             {
29                 $hash_password = md5($this->input->post('password'));
30                 $user_detail = $this->M_login->authenticate($username,$hash_password);
31                 # $data['userDatta'] = $user_details;
32                 if(!empty($user_detail))
33                 {
34                     $this->session->set_userdata($user_detail);
35                     $this->session->set_userdata('is_logged_in',TRUE);
36                     // $this->M_GeneratePDF->Test($this->input->post('spooky'));
37                     $this->LoadDashboard($user_detail['usertype']);
38                 } else {
39                     $data['errorMessage'] = 'Invalid username or password';
40                 }
41             } else {
42                 $data['errorMessage'] = 'Username cannot be empty';
43             }
44         }
45
46         if(null!=$this->session->userdata('is_logged_in') && null!=$this->session->userdata('usertype'))
47         {
48             $this->LoadDashboard($this->session->userdata('usertype'));
49         }
50
51         $this->load->view('template/header',$data);
52         $this->load->view('V_login',$data);
53     }

```

Figure 4.3.3 Piece of Code of Login Controller

4.3.1.2 Manage Module

Manage Module is connected to the Admin Dashboard. The user type who interact with this module is the Admin. The admin user is privileged to Add, Delete, and Update the items such as Boats, Owners, Skippers, Fish Categories, Fish Species, and Users.

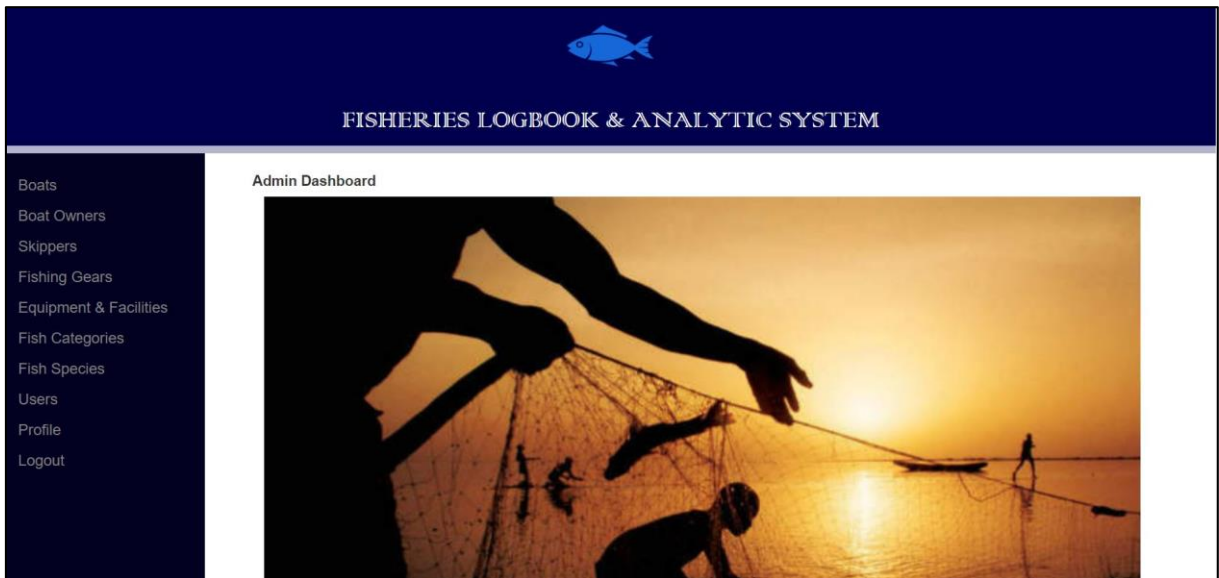


Figure 4.3.4 Admin Dashboard

```

C_AdminDashboard.php x
22
23 private function LoadAdminDashboard()
24 {
25     $this->VerifyAndRedirect();
26
27     $data['pageTitle'] = 'Admin Dashboard';
28
29     $this->load->view('template/header',$data);
30     $this->load->view('sidebars/AdminSidebar',$data);
31     $this->load->view('V_AdminDashboard');
32     $this->load->view('template/footer');
33 }
34
35 public function LoadManageBoats()
36 {
37     $this->VerifyAndRedirect();
38     $this->load->model('M_adminDashboard');
39
40     $data['pageTitle'] = 'Manage Boats';
41
42     $data['msg'] = '';
43
44     if ( 'delete' == $this->input->post('command') )
45     {
46         $boatid = $this->input->post('boatid');
47         $this->M_adminDashboard->DeleteBoat($boatid);
48         $data['msg'] = 'Successfully deleted '.$this->input->post('boatid');
49     }
50
51     $data['boatIDName'] = $this->M_adminDashboard->LoadBoatIDName();
52
53     $this->load->view('template/header', $data);
54     $this->load->view('sidebars/AdminSidebar',$data);
55     $this->load->view('V_manageBoats',$data);
56     $this->load->view('template/footer');
57 }
58
59 public function LoadManageBoatOwners()
60 {
61     $this->VerifyAndRedirect();
62     $this->load->model('M_adminDashboard');
63
64     $data['pageTitle'] = 'Manage Owners';
65
66     $data['msg'] = '';
67
68     if ('delete' == $this->input->post('command'))
69     {
70         $ownerid = $this->input->post('ownerid');
71         $this->M_adminDashboard->DeleteOwner($ownerid);
72         $data['msg'] = 'Successfully deleted '.$this->input->post('ownerid');
73     }
74

```

Figure 4.3.5 Piece of code of Admin Dashboard Controller

4.3.1.3 Logbook Module

Logbook Module is connected to the FI Dashboard. The user type who interacts with this module is the Fisheries Inspector (FI). The fisheries inspector is the person who manage all the logbook data, and fish catch data. He/She can add a new logbook and add fishing trips to the relevant logbook, and add trip days to the relevant trip, and add fish catch data to the relevant day using this Logbook Module.

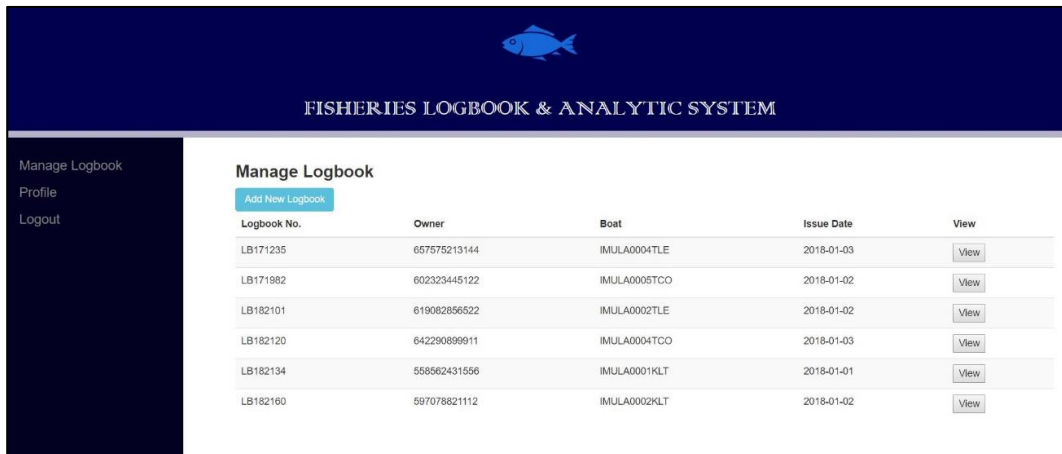


Figure 4.3.6 Manage Logbook Interface

```
C_FIDashboard.php x
17
18 private function LoadFIDashboard()
19 {
20     $this->VerifyAndRedirect();
21
22     $data['pageTitle'] = 'FI Dashboard';
23
24     $this->load->view('template/header', $data);
25     $this->load->view('sidebars/FISidebar', $data);
26     $this->load->view('V_FIDashboard');
27     $this->load->view('template/footer');
28 }
29
30 public function LoadManageLogbook()
31 {
32     $this->VerifyAndRedirect();
33
34     $this->load->model('M_FIDashboard');
35
36     $data['logbooks'] = $this->M_FIDashboard->LoadLogbooks();
37
38     $data['pageTitle'] = 'Manage Logbook';
39
40
41     $this->load->view('template/header', $data);
42     $this->load->view('sidebars/FISidebar', $data);
43     $this->load->view('V_manageLogbook', $data);
44     $this->load->view('template/footer');
45 }
46
47 public function LoadViewLogbook()
48 {
49     $this->VerifyAndRedirect();
50
51     $data['pageTitle'] = 'View Logbook';
52
53     $this->load->model('M_FIDashboard');
54
55     $logbook_no = $this->input->post('logbook_no');
56
57     $data['logbook_no'] = $logbook_no;
58
59     $data['logbookdata'] = $this->M_FIDashboard->LoadLogbookNo($logbook_no);
60
61     $data['trips'] = $this->M_FIDashboard->LoadFishingTrips($logbook_no);
62
63     $this->load->view('template/header', $data);
64     $this->load->view('sidebars/FISidebar', $data);
65     $this->load->view('V_viewLogbook', $data);
66     $this->load->view('template/footer');
67 }
68
69 public function LoadViewFishingTrip()
```

Figure 4.3.7 Piece of Code of FI Dashboard Controller

4.3.1.4 Report Module

Report Module is connected to the Manager Dashboard. The user type who interacts with this module is the Manager. The manager is able to generate general reports such as Boat Catch Data Reports and Production Reports using this Module.

The screenshot shows the 'FISHERIES LOGBOOK & ANALYTIC SYSTEM' interface. The main content area displays a report for 'Boat: IMULA0001KLT : Ran Putha | Catch Data Report: 2018'. The report includes a table with columns for months (Jan to Dec) and an 'Annual' total. The data is as follows:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Bigeye tuna	0	0	0	0	0	0	3578	0	0	0	0	0	3578
Black marlin	4100	0	0	0	0	3588	0	0	0	0	0	0	7688
Blue marlin	6455	0	0	0	0	2222	0	0	0	0	0	0	8677
Blue shark	3200	0	0	0	0	0	0	0	0	0	0	0	3200
Bullet tuna	4111	0	0	0	0	4789	0	0	0	0	0	0	8900
Frigate tuna	5468	0	0	0	0	4561	5410	0	0	0	0	0	15439

Figure 4.3.8 Boat Catch Data Report within Manage Reports Module

```

1  C_ManDashboard.php
2  <?php
3  class C_ManDashboard extends CI_Controller {
4
5      public function index()
6      {
7          $this->LoadManDashboard();
8      }
9
10     private function VerifyAndRedirect()
11     {
12         if(!($this->session->userdata('is_logged_in') && $this->session->userdata('usertype') == 'MAN'))
13         {
14             redirect(base_url().'index.php/C_login/AccessDenied');
15         }
16     }
17
18     private function LoadManDashboard()
19     {
20         $this->VerifyAndRedirect();
21
22         $data['pageTitle'] = 'Update Boat';
23         $data['signButtonText'] = 'Sign in';
24         $this->load->view('template/header', $data);
25         $this->load->view('sidebars/ManSidebar', $data);
26         $this->load->view('V_ManDashboard');
27         $this->load->view('template/footer');
28     }
29
30     public function LoadReport()
31     {
32         $this->VerifyAndRedirect();
33
34         $year = $this->input->get('year');
35         if (NULL == $year) {
36             $year = date("Y");
37         }
38
39         $data['pageTitle'] = 'Production Report: ' . $year;
40
41         $this->load->model('M_ManDashboard');
42
43         $data['jan'] = $this->M_ManDashboard->GetDistrictwiseTotalProduction($year.'-01-01',$year.'-02-01');
44         $data['feb'] = $this->M_ManDashboard->GetDistrictwiseTotalProduction($year.'-02-01',$year.'-03-01');
45         $data['mar'] = $this->M_ManDashboard->GetDistrictwiseTotalProduction($year.'-03-01',$year.'-04-01');
46
47         $data['q1'] = $this->M_ManDashboard->GetDistrictwiseTotalProduction($year.'-01-01',$year.'-04-01');
48
49         $data['apr'] = $this->M_ManDashboard->GetDistrictwiseTotalProduction($year.'-04-01',$year.'-05-01');
50         $data['may'] = $this->M_ManDashboard->GetDistrictwiseTotalProduction($year.'-05-01',$year.'-06-01');
51         $data['jun'] = $this->M_ManDashboard->GetDistrictwiseTotalProduction($year.'-06-01',$year.'-07-01');
52
53         $data['q2'] = $this->M_ManDashboard->GetDistrictwiseTotalProduction($year.'-04-01',$year.'-07-01');

```

Figure 4.3.9 Piece of Code of Manager Dashboard Controller

4.3.1.5 Analysis Module

Analysis Module is connected to the DA Dashboard. The user type who interact with this module is the Data Analyst. He is able to generate different analysis reports using the existing data. The Analysis Module consists of a forecasting section. Rather than displaying the existing data the system is able to forecast about the data variation in the future. Here the “Moving Average” has been used for the forecasting purposes. For example, considering about catch data of the recent five months, the system is able to forecast the amount of catch in the upcoming month.

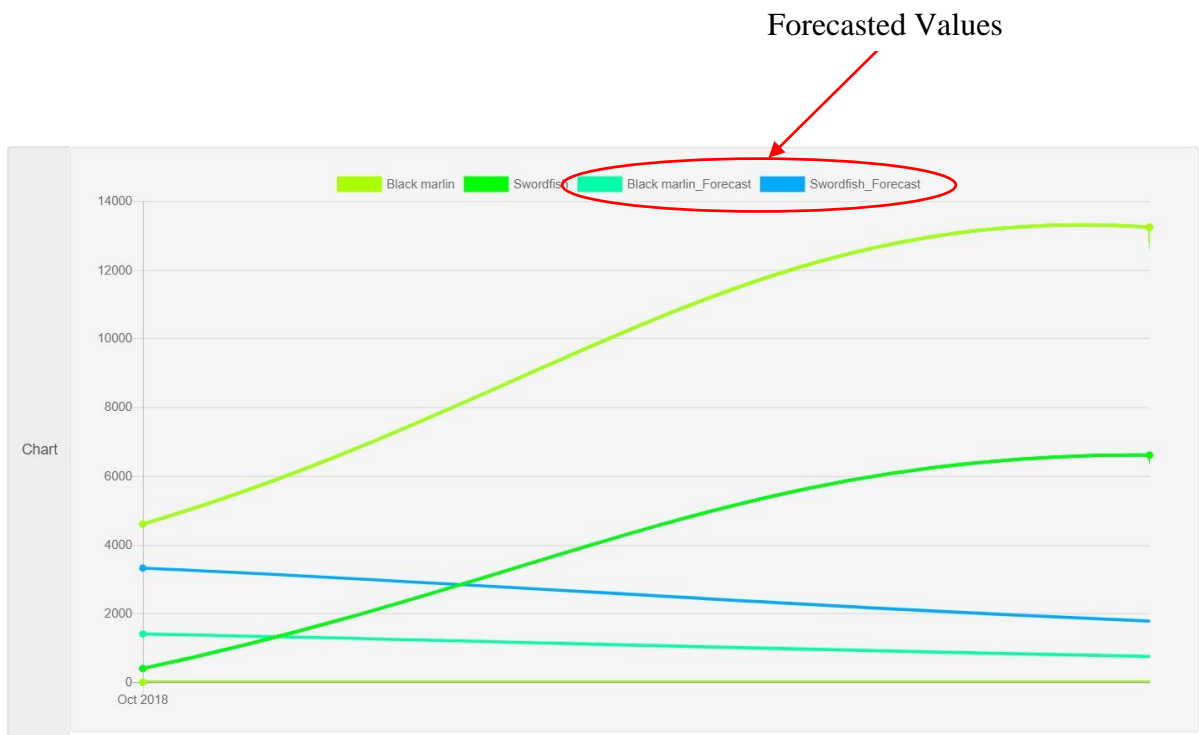


Figure 4.3.10 Forecasting in Analysis Module

```

63
64 public function LoadCreateReport()
65 {
66     $this->VerifyAndRedirect();
67
68     $data['msg'] = '';
69     $data['msgtype'] = '';
70     $data['msgobject'] = '';
71     $data['op_object'] = '';
72
73     $data['pageTitle'] = 'Admin Dashboard';
74
75     $this->load->model('M_DADashboard');
76
77     $reportid = $this->input->post('reportid');
78     $data['reportid'] = $reportid;
79     $this->session->reportid = $reportid;
80
81     $data['p'] = $this->input->post(NULL);
82
83     // If its new report, save it to database
84     if(NULL == $reportid)
85     {
86         $data['title'] = '';
87         $data['description'] = '';
88         $data['numitems'] = 0;
89         $data['finished'] = 0;
90
91         $data['itemlist'] = array();
92         $data['itemdata'] = array();
93
94         $ret = $this->M_DADashboard->InsertReport($reportid,'','',0,0);
95
96         $data['msg'] = $ret['msg'];
97         $data['msgtype'] = $ret['msgtype'];
98         $data['msgobject'] = $ret['msgobject'];
99
100         // set the newly entered report id
101         $reportid = $ret['reportid'];
102         $data['reportid'] = $reportid;
103         $this->session->reportid = $reportid;
104     }
105
106     $data['numitems'] = $this->M_DADashboard->getNumItems($reportid);
107
108     $urlImageData = array();
109
110     // If its a call for update report, update it
111     if ( 'Save' == $this->input->post('Submit')
112         || 'PrintPreview' == $this->input->post('Submit')
113         || 'Add' == $this->input->post('Submit')
114         || NULL != $this->input->post('MoveUp') || NULL != $this->input->post('MoveDown')
115         || NULL != $this->input->post('Delete') || NULL != $this->input->post('Refresh') )

```

Figure 4.3.11 Piece of Code of DA Dashboard Controller

4.3.2. Database System

4.3.2.1. Entity Relationship Diagram

The database system is designed through the Entity Relationship Diagram which is shown in Figure 4.3.12. In the diagram, only the main attributes are inserted related to the database tables. All the attributes are mentioned in the Relational Mapping of Database in Table 2.

4.3.2.2. Relational Mapping of the Database

Table	Attributes
fishing_trip	(<u>logbook_no</u> , date_of_issue, departure_date, departure_port, arrival_date, arrival_port, date_of_set, start_fishing_time, start_longitude, end_longitude, start_latitude, end_latitude, observation, <i>local_boat_reg_no</i> , <i>skipper_NIC</i> , <i>username</i>)
Boat	(<u>local_boat_reg_no</u> , boat_name, IMO_no, IOTC_no, NFO_license_no, HSFO_license_no, length_of_boat, radio_call_sign, gross_tonnage, no_of_crew, remarks)
equipmet_&_facility	(<u>equip_id</u> , SSB_radio, VMS, compass, GPS, fish_hold, freezer_unit, eco_sounder, fish_finder_sonar, net_hauler, ice_holder)
boat_owner	(<u>owner_NIC</u> , owner_name, address, mobile_no, tel_no)
Skipper	(<u>skipper_NIC</u> , skipper_name, skipper_license_no)
fish_species	(<u>fish_species_id</u> , fish_code, fish_name, <i>fish_cat_code</i>)
fish_category	(<u>fish_cat_id</u> , fish_cat_name)
fishing_trip_cath_fish_species	(<u>fish_species_id</u> , <u>logbook_no</u> , weight_of_fish_for_day, no_of_fishes_for_day, total_weight_of_fish, total_no_of_fishes)
fishing_trip_has_equipment	(<u>equip_id</u> , <u>logbook_no</u>)
owner_owns_boat	(<u>local_boat_reg_no</u> , <u>owner_NIC</u>)
fishing_trip_has_fishing_gear	(<u>logbook_no</u> , <u>fishing_gear_id</u>)
User	(<u>username</u> , user_type)
fisheries_inspector	(<i>username</i> , password)
Admin	(<i>username</i> , password)
Manager	(<i>username</i> , password)
data_analyst	(<i>username</i> , password)
fishing_gear	(<u>gear_id</u> , gear_type)
long_line_gear	(<i>gear_id</i> , main_line_material, branch_line_material, average_float_line_length, average_branch_line_length, distance_between_brancg_line, tatal_hooks)

gill_net	(<i>gear_id</i> , net_material, mesh_size, ply_of_net, height_of_net, length_of_net, no_of_net_pieces)
purse_seine	(<i>gear_id</i> , length_of_ring_net, height_of_ring_net, type_of_FADs_used, no_of_FADs_used)
Fad	<u>fad_ID</u> , fad_name
Report	<u>report_ID</u> , report_name, no_of_items
report_item	<u>report_ID</u> , <u>item_ID</u> , order_index
report_item_text	<u>report_ID</u> , <u>item_ID</u> , title, text
report_item_table	<u>report_ID</u> , <u>item_ID</u> , title, no_of_rows, no_of_cols
table_row	<u>report_ID</u> , <u>item_ID</u> , <u>row_ID</u>
row_data	<u>report_ID</u> , <u>item_ID</u> , <u>row_ID</u> , <u>data_ID</u> , data
report_item_chart	<u>report_ID</u> , <u>item_ID</u> , title, chart
report_item_map	<u>report_ID</u> , <u>item_ID</u> , title, map

Table 4.3.1: Relational Mapping of the Database

4.3.3. User Interface Design

User interfaces were designed after thoroughly consider about the users. The users have been identified as less IT literate persons. And they are completely new to these technologies. Because of this, the user interfaces are designed higher user-friendliness and lower complexity. Techniques such as windows, icons, menus, and navigation are used when designing interfaces. Following are few examples of interfaces.

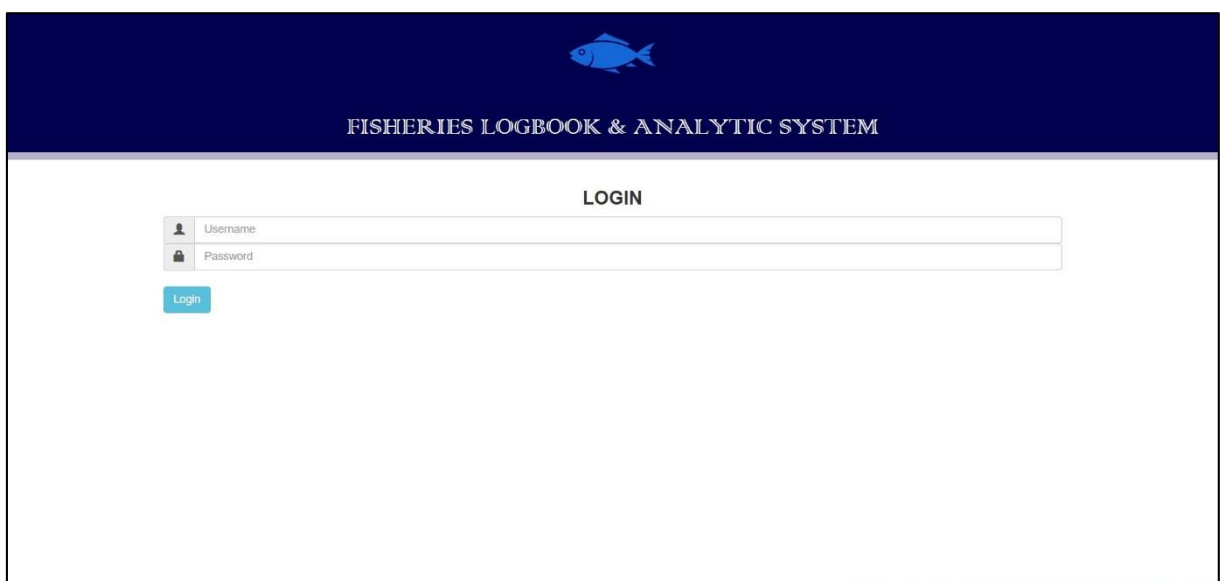


Figure 4.3.13: Login Interface

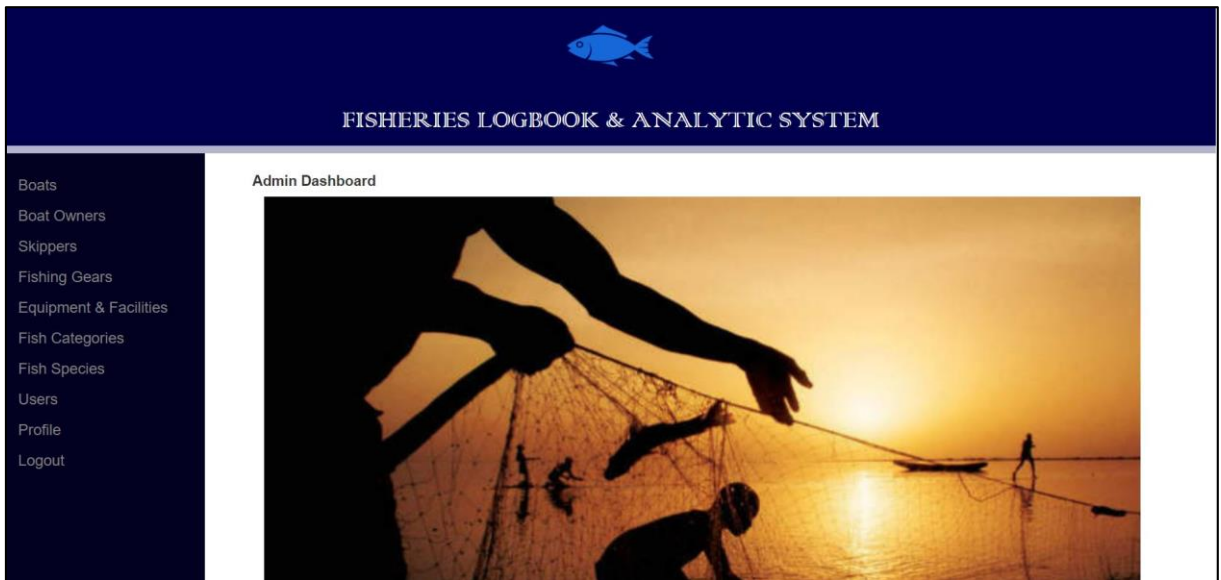


Figure 4.3.14: Admin Dashboard Interface

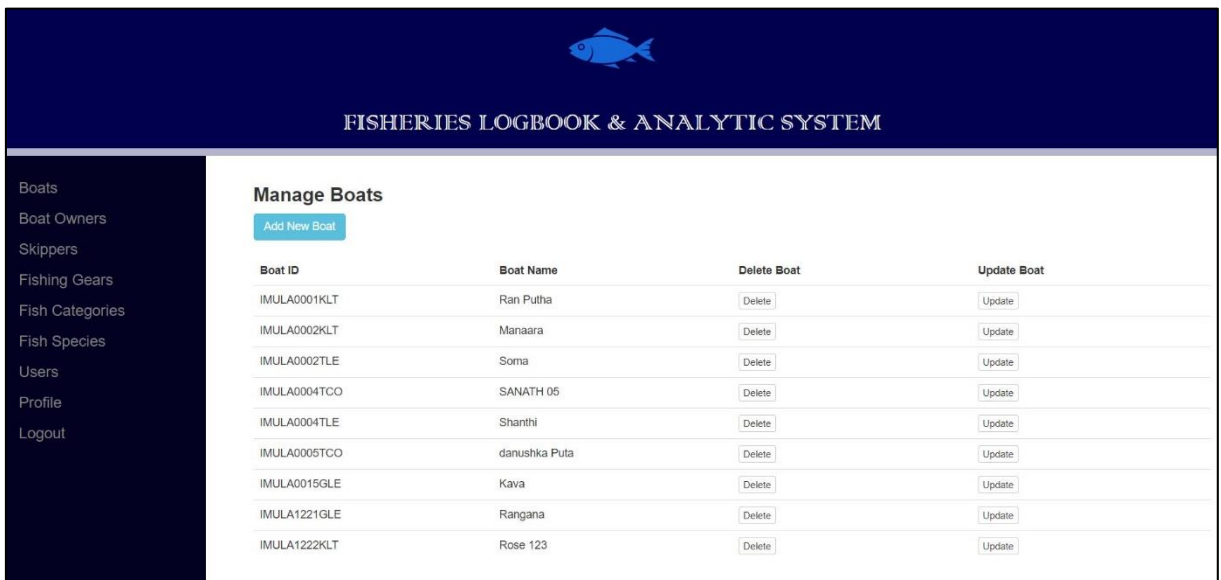



Figure 4.3.15: Manage Boats Interface



FISHERIES LOGBOOK & ANALYTIC SYSTEM

- Boats
- Boat Owners
- Skippers
- Fishing Gears
- Fish Categories
- Fish Species
- Users
- Profile
- Logout


Add New Skipper

NIC

Name

Skipper License No.

Figure 4.3.16: Add New Skipper Interface



FISHERIES LOGBOOK & ANALYTIC SYSTEM

- Manage Logbook
- Profile
- Logout

Add New Fishing Trip

Trip Details

Date of Issue <input type="text" value="dd/mm/yyyy"/>	Departure Date <input type="text" value="dd/mm/yyyy"/>	Departure Port <input type="text" value="Colombo"/>
Arrival Date <input type="text" value="dd/mm/yyyy"/>	Arrival Port <input type="text" value="Colombo"/>	Local Boat Reg. No. <input type="text"/>
Skipper NIC <input type="text"/>	Logsheet Created By <input type="text"/>	Date Created <input type="text" value="dd/mm/yyyy"/>
		Observation <input type="text"/>

Trip Day Details

Date of Set <input type="text" value="dd/mm/yyyy"/>	Start Fishing Time <input type="text" value="--:--"/>	Start Longitude <input type="text"/>	Start Latitude <input type="text"/>	End Longitude <input type="text"/>	End Latitude <input type="text"/>
--	--	---	--	---------------------------------------	--------------------------------------

Figure 4.3.17: Manage Logbook Interface



FISHERIES LOGBOOK & ANALYTIC SYSTEM

Manage Reports
Profile
Logout

Manage Reports > View Report

Report ID : 76

[Save](#) [Save & Print](#) [Back](#)

Title Fish Production of 2018

Description Fish Production of 2018

[Move Up](#) [Move Down](#) [Delete](#) [Refresh & Save](#)

Fish Species 00 Black marlin

Fish Species 01 Striped marlin

Fish Species 02 Frigate tuna

Fish Species 03 Kawakawa

Start Date 01/01/2018

End Date 31/07/2018

Chart Type Doughnut

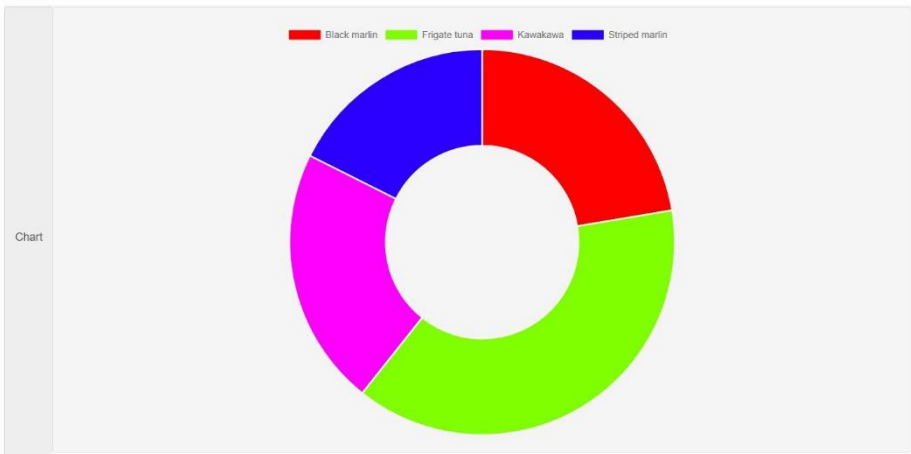


Figure 4.3.18 Generate Analytic Reports

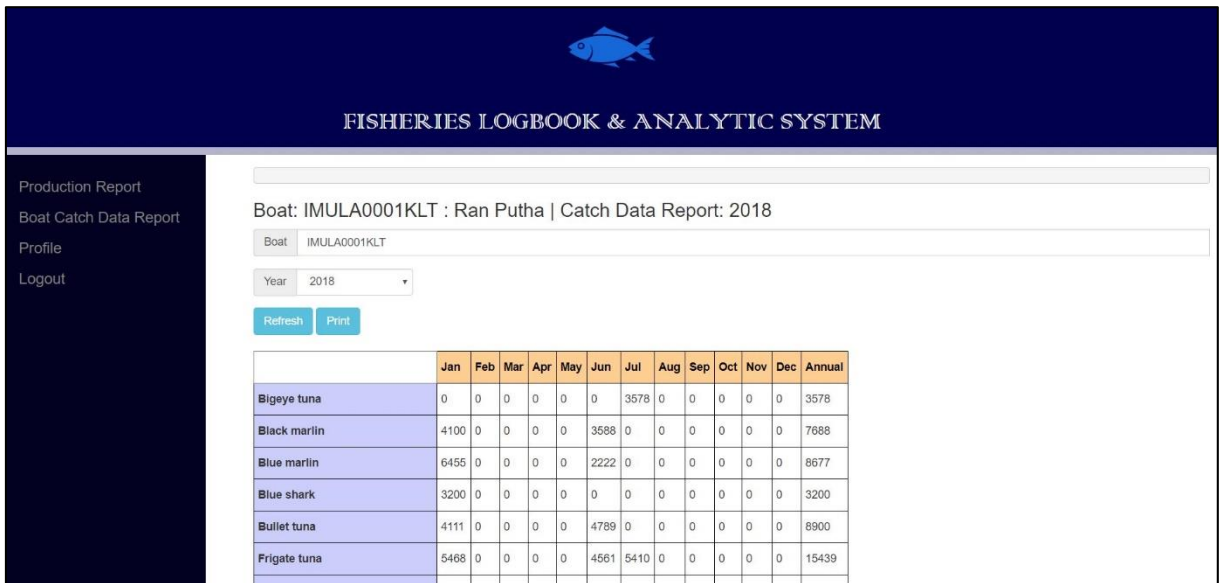


Figure 4.3.19 Generate Boat Catch Data Reports

4.3.3.1. Method used for Interface Designing

All the interfaces were identified by creating the sequence diagrams and the connectivity among the different interfaces was designed as wireframes. The user will be able to open different interfaces for different operations using the sidebar.

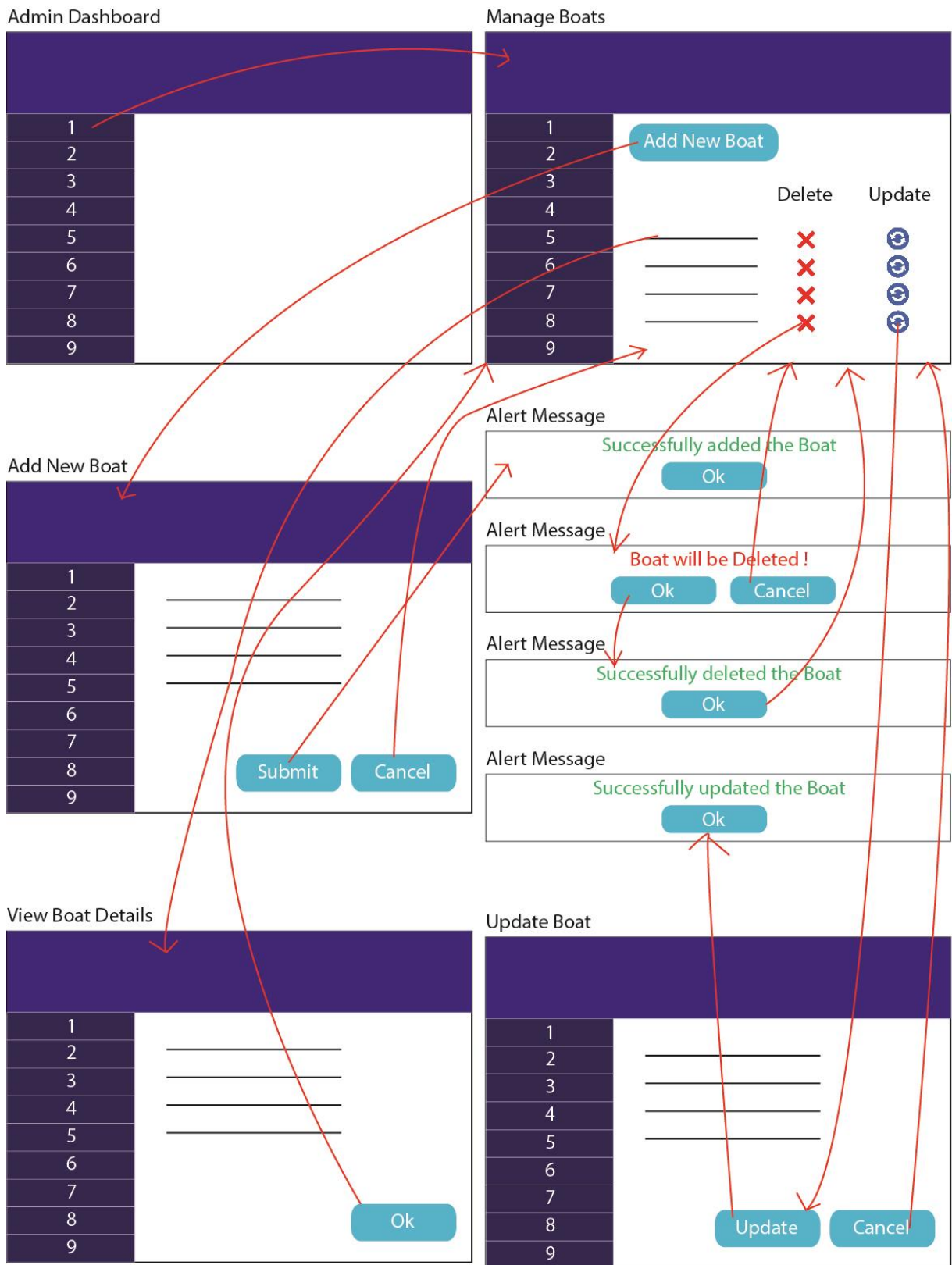


Figure 4.3.20: Connectivity among interfaces related to Manage Boats (Admin Dashboard)

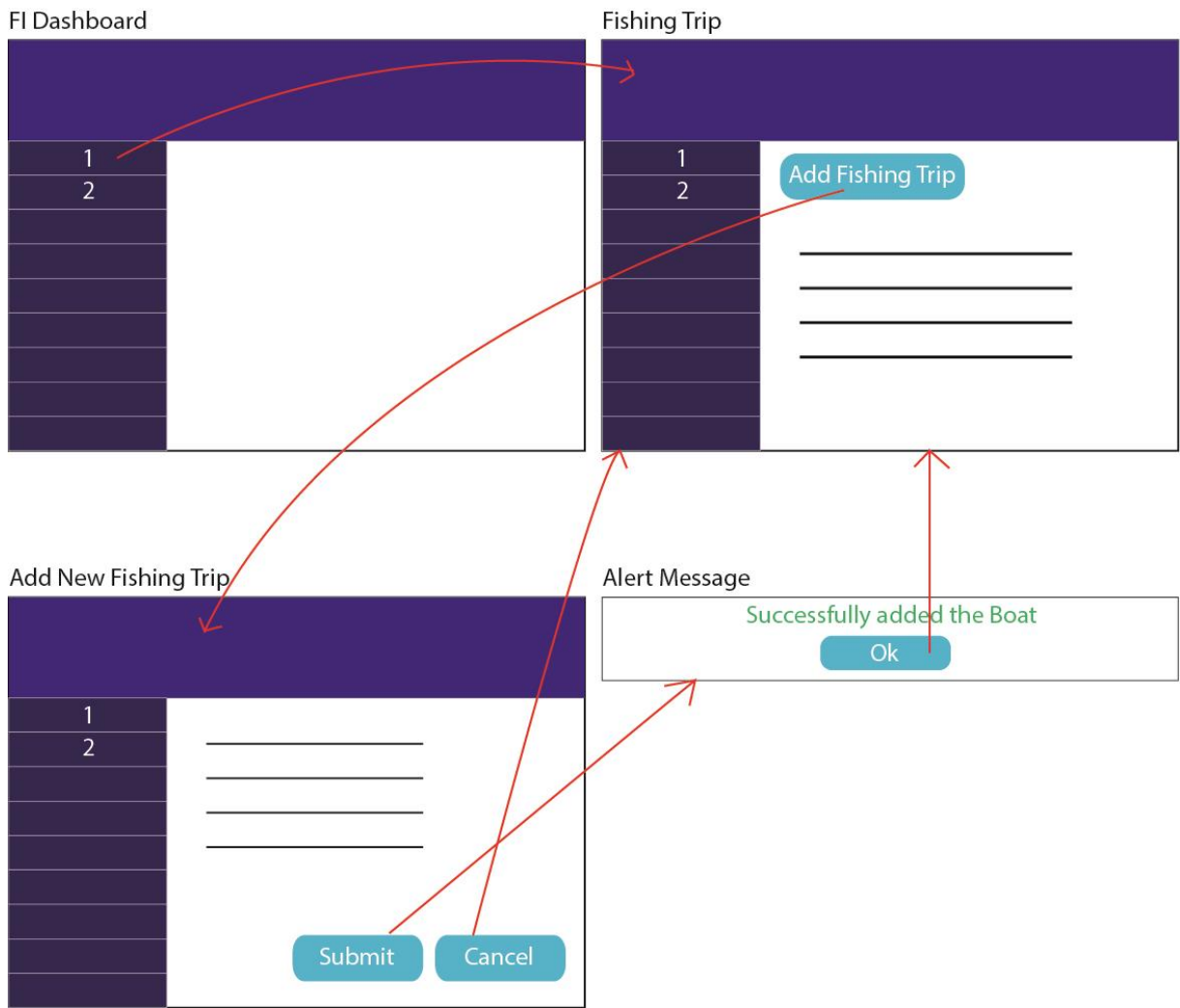


Figure 4.3.21: Connectivity among interfaces related to Logbook (FI Dashboard)

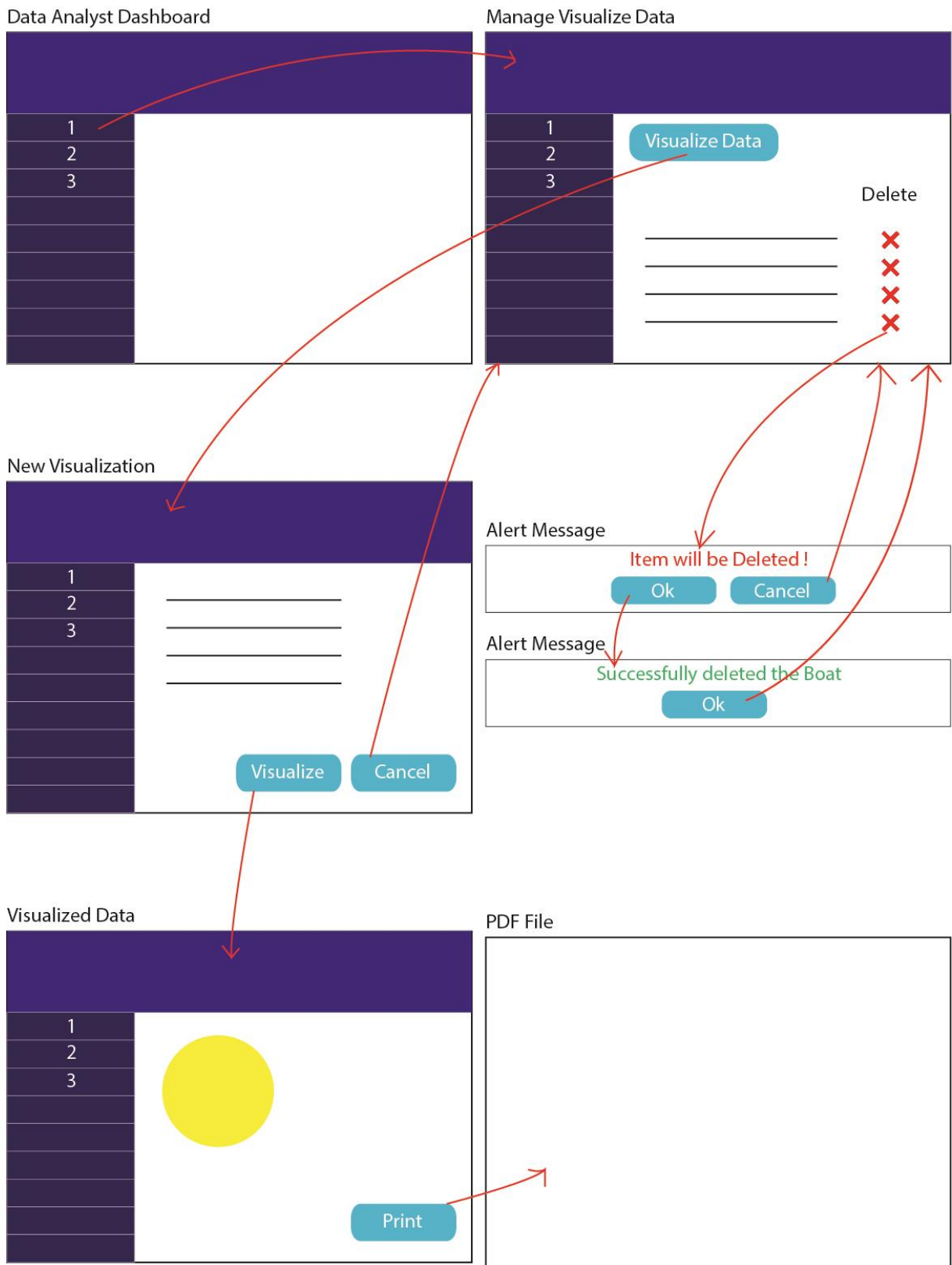


Figure 4.3.22: Connectivity among interfaces related to Related to Analyze Data (DA Dashboard)

Chapter 5 : Implementation

5.1.Implementation Strategy

Implementation of the system was done through the MVC architecture. According to the system architecture [Figure 4.3.1] introduced under the System Design [Chapter 4.3], the main controller was implemented as the Login Controller and the all the other controllers are connected through the Login Controller.

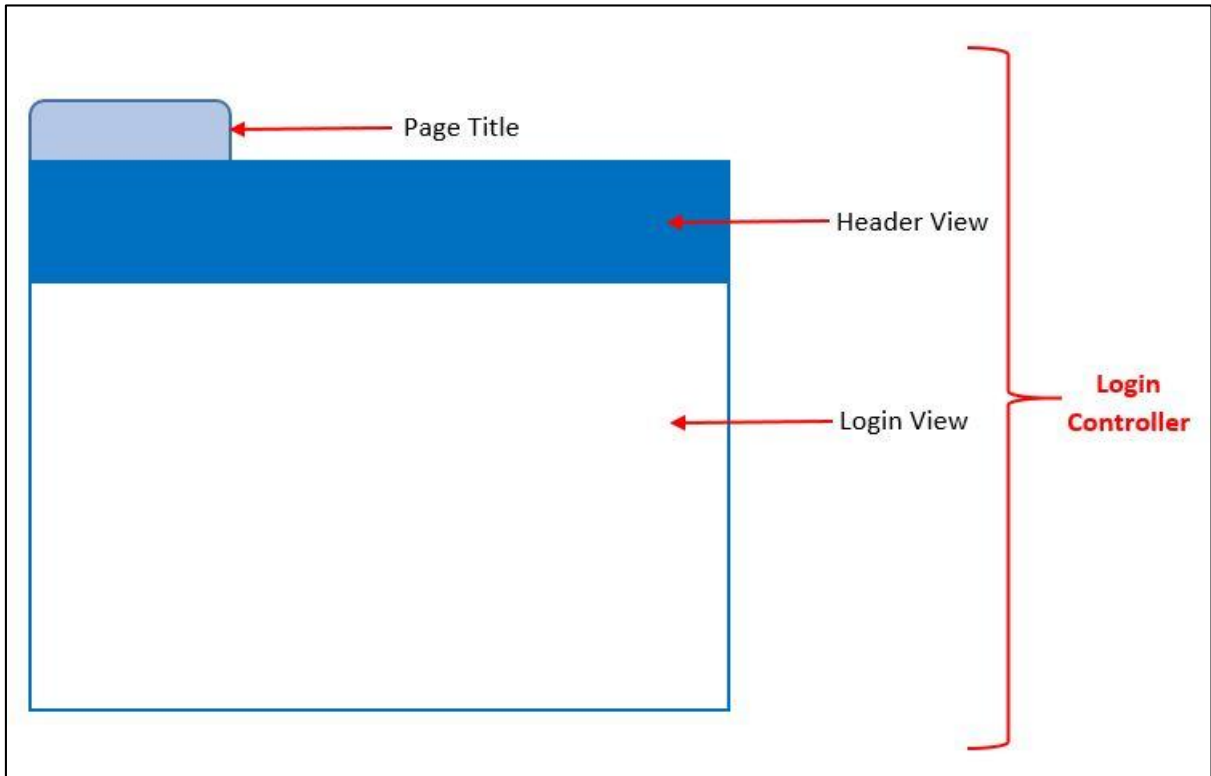


Figure 5.1.1: Login Controller (Main Controller) Components

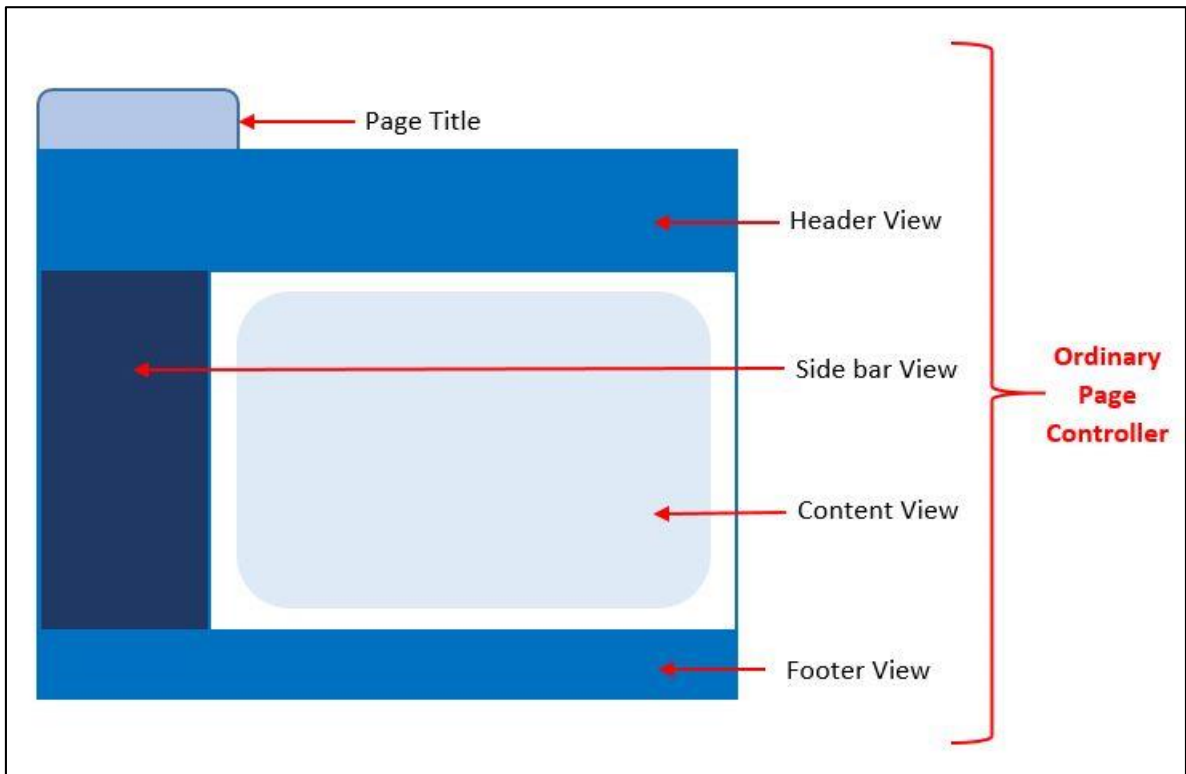


Figure 5.1.2: Ordinary Page Controller Components

- **Page Title:** Will be displayed always
- **Header View and Footer View:** Will be displayed always
- **Side bar View:** Depend on the User Type
- **Content View:** Depend on the Operation

5.2. Technology Used

The system was developed using PHP, and the MVC Architecture was used through the CodeIgniter Framework. MySQL was used for database management.

Chapter 6 : Evaluation and Testing

6.1. Method used for User Evaluation

The Fisheries Logbook & Analytic System is evaluated by users covering different aspects of the system. User evaluation is done through a questionnaire and user acceptance testing. The questionnaire which is given in Appendix 3 is used to do the evaluation of the system.

6.2. Test Approach

Different types of testing are carried out to test the functional and the non-functional requirements of the system.

6.2.1. Functionality Testing

Definition:

In functionality testing, all the links in web pages, forms which used for submitting information by the user, database connection and etc. will be tested.

Method of Testing:

- Check all the links
 - Test all internal links.
 - Test links used to send notifications to admin or manager.
 - Test to check if there are any orphan pages.
 - Check for broken links in all above-mentioned links.
- Test forms on all pages
 - Check all the validations on each field.
 - Check for default values of the fields.
- Database testing
 - Check for data integrity and errors while add, delete, update the data or do any database related functionality.
 - Check whether all the database queries are executing correctly, data is retrieved and also updated correctly.

6.2.2. Usability Testing

Definition:

In usability testing, navigation testing, content checking, and etc will be carried out.

Method of Testing:

- Test for navigation
 - Easiness to use the system.
 - Check whether instructions are provided in each essential occasion.
 - Check whether the instructions provided are clear and satisfy its purpose.
 - Check whether the consistency is there in the system.
- Content checking
 - Check the logical concept behind the content (easiness to understand the content).
 - Check whether basic web design concepts are achieved.

6.2.3. Interface Testing

Definition:

Web server interface, application server interface, and database server interface will be tested in Interface Testing.

Method of Testing:

- Check whether all the interactions between web application, and database servers are executed and errors are handled properly.
- Check what happens if the connection to the web server is lost or user interrupts any transaction.

6.2.4. Compatibility Testing

Definition:

Under compatibility testing, Browser compatibility, Operating system compatibility, Mobile browsing, and Printing options will be tested.

Method of Testing:

- Browser compatibility
 - Cross browser compatibility testing of the system.
The system will be tested on different web browsers such as Google Chrome and Firefox.

- Printing options
 - Test whether the pages are fit into the paper size mentioned in the printing options and whether all the elements are printing properly.

6.2.5. User Acceptance Testing

Definition:

In user acceptance testing, it will be tested whether the users can handle the required scenarios through the system.

Method of Testing:

- Few users from the fisheries department will be selected in a way which covers all the user types and gives the system for them to test.
- The feedback from the users will be collected through using the User Evaluation Sheet which is attached in Appendix 3.

6.3. User Evaluation Results

#	Evaluation Criteria	Low				High	NA
		1	2	3	4	5	
1.	Overall, I am satisfied with how easy it is to use this system						
2.	It was simple to use this system						
3.	I can effectively complete my work using this system						
4.	I am able to complete my work quickly using this system						
5.	I feel comfortable using this system						
6.	It was easy to learn to use this system						
7.	I believe I became productive quickly using this system						
8.	The system gives error messages that clearly tell me how to fix problems						
9.	The information provided with this system is clear						
10.	It is easy to find the information I needed						
11.	The information is effective in helping me complete the tasks and scenarios						
12.	The organization of information on the system screens is clear						
13.	The interface of this system is pleasant						
14.	I like using the interface of this system						
15.	Overall, I am satisfied with this system						

#	Evaluation Criteria	Low				High	NA
		1	2	3	4	5	
16.	Overall, I am satisfied with how easy it is to use this system						
17.	It was simple to use this system						
18.	I can effectively complete my work using this system						
19.	I am able to complete my work quickly using this system						
20.	I feel comfortable using this system						
21.	It was easy to learn to use this system						
22.	I believe I became productive quickly using this system						
23.	The system gives error messages that clearly tell me how to fix problems						
24.	The information provided with this system is clear						
25.	It is easy to find the information I needed						
26.	The information is effective in helping me complete the tasks and scenarios						
27.	The organization of information on the system screens is clear						
28.	The interface of this system is pleasant						
29.	I like using the interface of this system						
30.	Overall, I am satisfied with this system						

#	Evaluation Criteria	Low				High	NA
		1	2	3	4	5	
31.	Overall, I am satisfied with how easy it is to use this system						
32.	It was simple to use this system						
33.	I can effectively complete my work using this system						
34.	I am able to complete my work quickly using this system						
35.	I feel comfortable using this system						
36.	It was easy to learn to use this system						
37.	I believe I became productive quickly using this system						
38.	The system gives error messages that clearly tell me how to fix problems						
39.	The information provided with this system is clear						
40.	It is easy to find the information I needed						
41.	The information is effective in helping me complete the tasks and scenarios						
42.	The organization of information on the system screens is clear						
43.	The interface of this system is pleasant						
44.	I like using the interface of this system						
45.	Overall, I am satisfied with this system						

#	Evaluation Criteria	Low				High	NA
		1	2	3	4	5	
46.	Overall, I am satisfied with how easy it is to use this system						
47.	It was simple to use this system						
48.	I can effectively complete my work using this system						
49.	I am able to complete my work quickly using this system						
50.	I feel comfortable using this system						
51.	It was easy to learn to use this system						
52.	I believe I became productive quickly using this system						
53.	The system gives error messages that clearly tell me how to fix problems						
54.	The information provided with this system is clear						
55.	It is easy to find the information I needed						
56.	The information is effective in helping me complete the tasks and scenarios						
57.	The organization of information on the system screens is clear						
58.	The interface of this system is pleasant						
59.	I like using the interface of this system						
60.	Overall, I am satisfied with this system						

6.4. Test Cases

Different test cases were developed in order to test the system. The system was tested against those test cases which are attached in Appendix 4.

Chapter 7 : Conclusion and Future Work

7.1. Conclusion

The proposed system could analyze the collected data from multiday boats of Sri Lank and use for decision making. Four user types are involved with the system during the process of registration, entering of fish catch data, analyzing the entered data and report generation. To facilitate these areas of functionalities the system has been developed consisting of five modules. Accordingly, the system will increase the efficiency, effectiveness and the accuracy of the process and will contribute to the fisheries industry as a good analytic tool.

7.2. Future Work

This system can be enhanced by integrating the mobile application for the data entering process. Through that, the skippers will be able to enter data into the system directly.

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APPENDICES

APPENDIX 1 : Activity Diagrams for Existing System

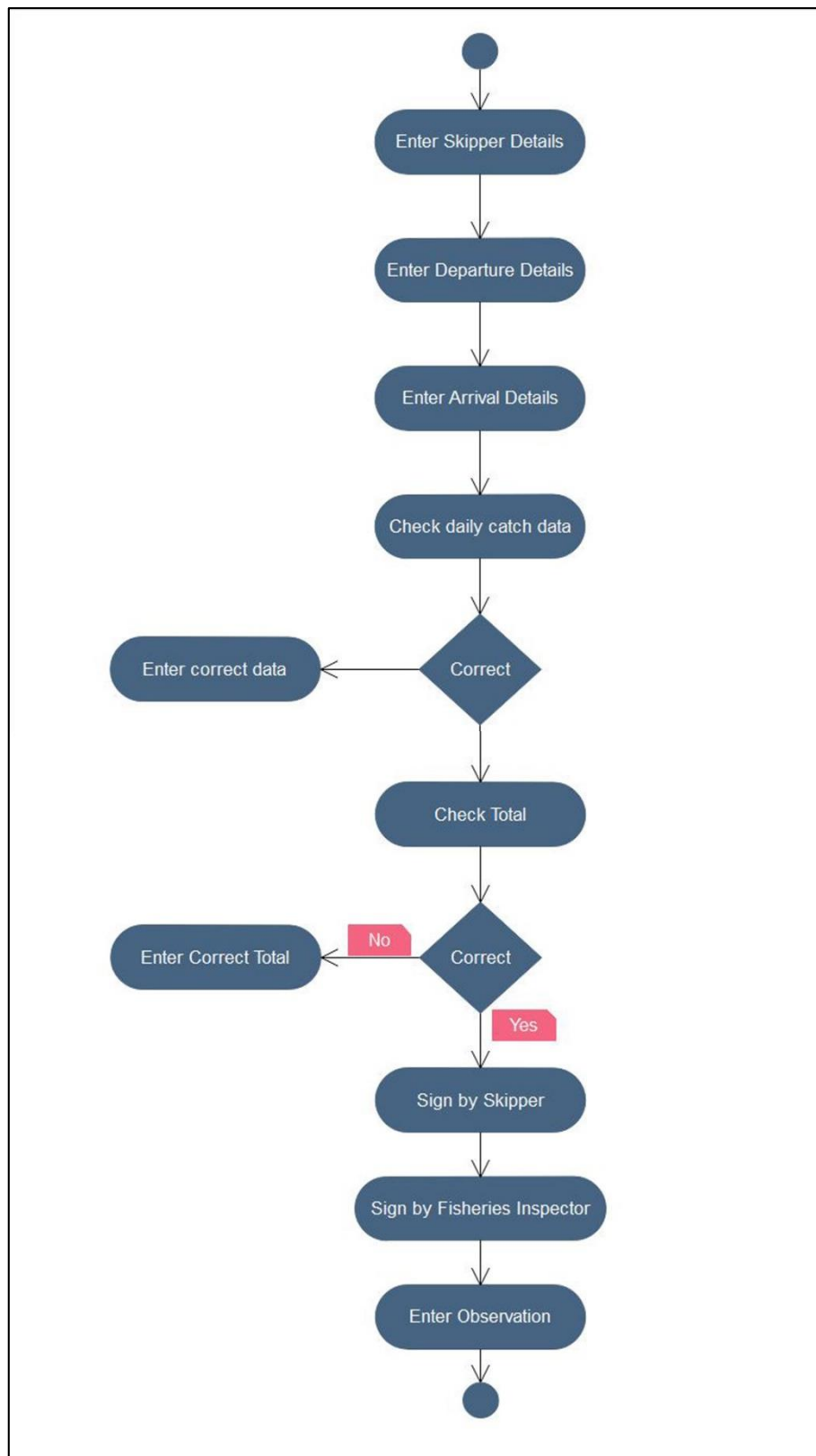


Figure 0.1: Check Catch Data

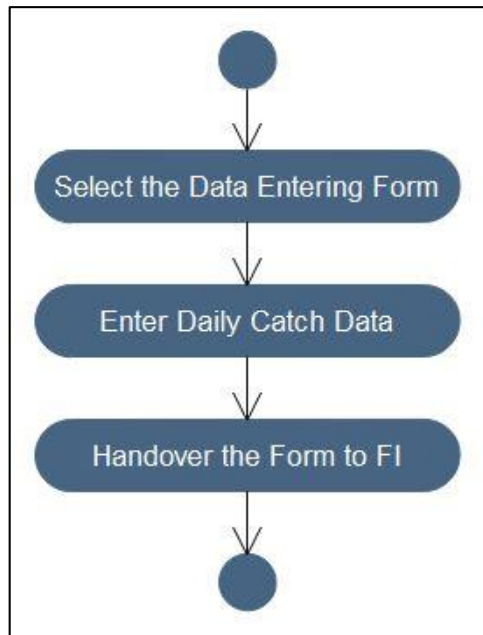


Figure 0.2: Enter Daily Catch Data into Manual Logbook

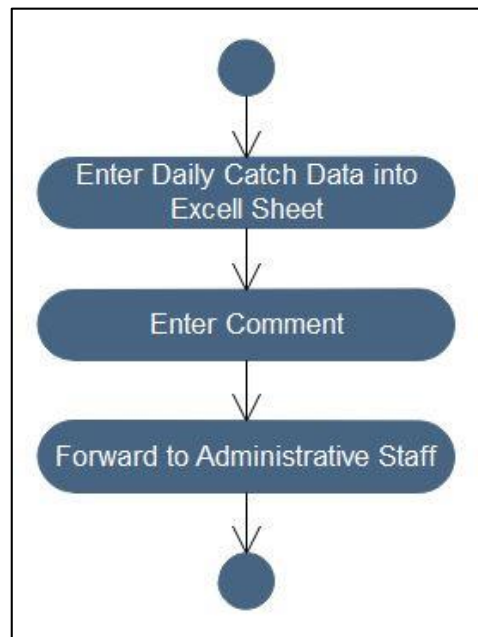


Figure 0.3: Enter Catch Data into Excel Sheet

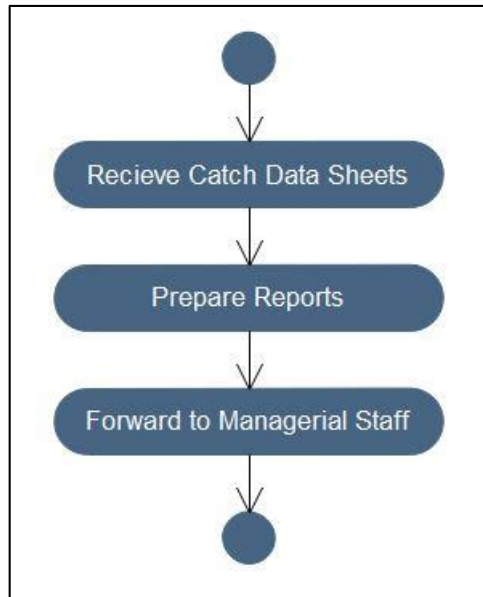


Figure 0.4: Prepare Reports

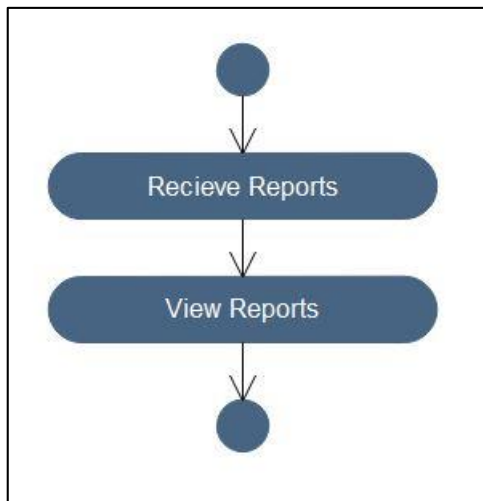


Figure 0.5: View Reports

APPENDIX 2 : Detailed System Architecture

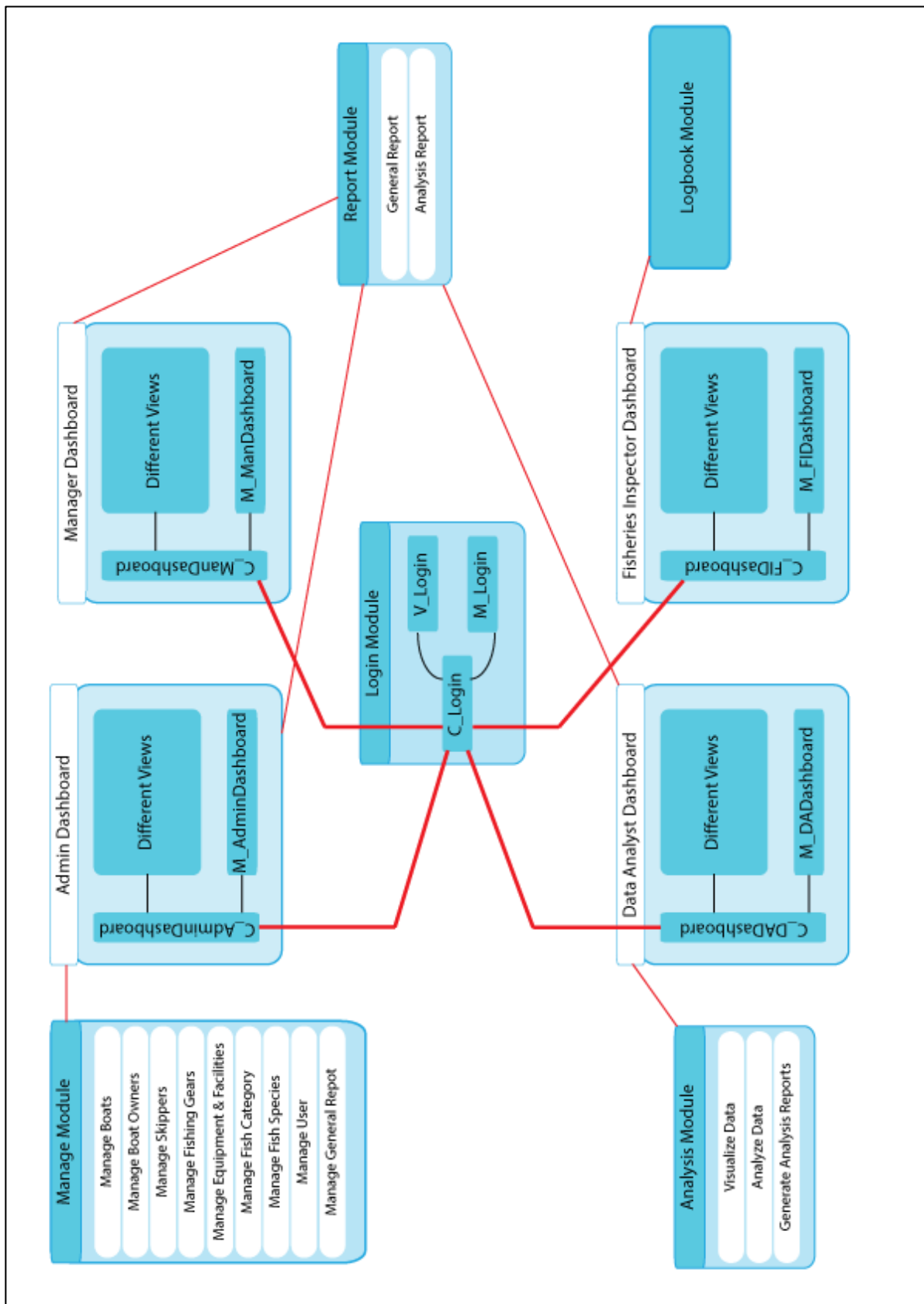


Figure 0.1: Detailed System Architecture

APPENDIX 3 : Use Evaluation Sheet

#	Evaluation Criteria	Low				High	NA
		1	2	3	4	5	
61.	Overall, I am satisfied with how easy it is to use this system						
62.	It was simple to use this system						
63.	I can effectively complete my work using this system						
64.	I am able to complete my work quickly using this system						
65.	I feel comfortable using this system						
66.	It was easy to learn to use this system						
67.	I believe I became productive quickly using this system						
68.	The system gives error messages that clearly tell me how to fix problems						
69.	The information provided with this system is clear						
70.	It is easy to find the information I needed						
71.	The information is effective in helping me complete the tasks and scenarios						
72.	The organization of information on the system screens is clear						
73.	The interface of this system is pleasant						
74.	I like using the interface of this system						
75.	Overall, I am satisfied with this system						

Table 0.1: User Evaluation Sheet

APPENDIX 4 : Test Cases

Test Case ID	TC01	
Test Title	Login page - Successful login to the system	
Test Description	A registered user should be able to successfully login to the system.	
Preconditions	User must be already registered in the system	
Test Steps	Expected Results	Actual Results
<ol style="list-style-type: none"> 1. Navigate to the system 2. Enter valid Username 3. Enter valid Password 4. Click 'Login' 	User should login to the system. Relevant Dashboard will be displayed after validating the user.	Pass

Test Case ID	TC02	
Test Title	Login page - Unsuccessful login to the system	
Test Description	A user will not be able to successfully login to the system with invalid login credentials.	
Preconditions	None	
Test Steps	Expected Results	Actual Results
<ol style="list-style-type: none"> 1. Navigate to the system 2. Enter invalid Username or/and 3. Enter invalid Password 4. Click 'Login' 	User should not login to the system. Display error message 'Invalid Username or Password'.	Pass

Test Case ID	TC03	
Test Title	Manage Boats - Add New Boat to the system	
Test Description	Administrator will be able to add a new boat to the system.	
Preconditions	User must be logged in to the system	
Test Steps	Expected Results	Actual Results
<ol style="list-style-type: none"> 1. Click 'Add New Boat' 2. Enter required fields 3. Click 'Submit' 	New boat should be added to the system and display alert message 'Successfully added the Boat'.	Pass

Test Case ID	TC04	
Test Title	Manage Boats - Delete Boat from the system	
Test Description	Administrator will be able to delete boat from the system.	
Preconditions	User must be logged in to the system	
Test Steps	Expected Results	Actual Results
<ol style="list-style-type: none"> 1. Click 'Delete Boat' 	Display confirmation message 'Boat will be deleted!'	Pass
<ol style="list-style-type: none"> 2. Click 'Ok' 	The boat should be deleted from the system and display the alert message 'Successfully deleted the Boat'	Pass

Test Case ID	TC05	
Test Title	Manage Boats - Update Boat	
Test Description	Administrator will be able update the boat details.	
Preconditions	User must be logged in to the system	
Test Steps	Expected Results	Actual Results
<ol style="list-style-type: none"> 1. Click Update Boat' 2. Change the boat details 3. Click 'Update' 	Boat details should be updated and display the alert message 'Successfully updated the Boat'	Pass

Test Case ID	TC06	
Test Title	Manage Boats - View Boat	
Test Description	Administrator will be able view boat details.	
Preconditions	User must be logged in to the system	
Test Steps	Expected Results	Actual Results
<ol style="list-style-type: none"> 1. Click 'Boat ID' 	Selected boat's details should be displayed.	Pass

Test Case ID	TC07		
Test Title	Generate General Reports		
Test Description	Administrator will be able generate general reports.		
Preconditions	User must be logged in to the system		
Test Steps	Expected Results	Actual Results	
<ol style="list-style-type: none"> 1. Click 'Generate New Report' 2. Selects the relevant fields to generate report 3. Click 'Generate' 	The system should generate the report using the given fields.	Pass	

Test Case ID	TC08		
Test Title	Print Report		
Test Description	Administrator and Data Analyst will be able generate general reports.		
Preconditions	User must be logged in to the system. User must generated a report.		
Test Steps	Expected Results	Actual Results	
<ol style="list-style-type: none"> 1. Click 'Print' 	The PDF file of the report should be generated.	Pass	

Test Case ID	TC09	
Test Title	FI Dashboard - Add New Fishing Trip	
Test Description	Fisheries Inspector will be able to add a new fishing trip to the system.	
Preconditions	User must be logged in to the system	
Test Steps	Expected Results	Actual Results
<ol style="list-style-type: none"> 1. Click 'Add New Fishing Trip' 2. Enter required fields 3. Click 'Submit' 	<p>New fishing trip should be added to the system and display alert message 'Successfully added the Fishing Trip'.</p>	Pass

Test Case ID	TC10	
Test Title	FI Dashboard - View Fishing Trip	
Test Description	Fisheries Instructor will be able view fishing trip details.	
Preconditions	User must be logged in to the system	
Test Steps	Expected Results	Actual Results
<ol style="list-style-type: none"> 1. Click 'Fishing trip ID' 	<p>Selected fishing trip details should be displayed.</p>	Pass

Test Case ID	TC11	
Test Title	DA Dashboard - Visualize Data	
Test Description	Data Analyst will be able visualize data	
Preconditions	User must be logged in to the system	
Test Steps	Expected Results	Actual Results
1. Click 'Visualize Data' on DA Dashboard	Visualize Data page should be displayed.	Pass
2. Click 'Visualize Data' on Visualize Data page 3. Enter fields to be visualized 4. Click 'Visualize'	Visualized data using given fields should be displayed.	Pass

Test Case ID	TC12	
Test Title	Visualize Data - Delete visualized data from the system	
Test Description	Data Analyst will be able to delete visualized data from the system.	
Preconditions	User must be logged in to the system	
Test Steps	Expected Results	Actual Results
1. Click 'Delete'	Display confirmation message 'File will be deleted!'	Pass
2. Click 'Ok'	The visualized data should be deleted from the system and display the alert message 'Successfully deleted the file'	Pass

Test Case ID	TC13	
Test Title	DA Dashboard - Analyze Data	
Test Description	Data Analyst will be able analyze data	
Preconditions	User must be logged in to the system	
Test Steps	Expected Results	Actual Results
1. Click 'Analyze Data' on DA Dashboard	Analyze Data page should be displayed.	Pass
2. Click 'Analyze Data' on Analyze Data page 3. Enter fields to be analyzed 4. Click 'Analyze'	Analyzed data using given fields should be displayed.	Pass

Test Case ID	TC14	
Test Title	Analyze Data - Delete analyzed data from the system	
Test Description	Data Analyst will be able to delete analyzed data from the system.	
Preconditions	User must be logged in to the system	
Test Steps	Expected Results	Actual Results
1. Click 'Delete'	Display confirmation message 'File will be deleted!'	Pass
2. Click 'Ok'	The analyzed data should be deleted from the system and display the alert message 'Successfully deleted the file'	Pass

Test Case ID	TC15	
Test Title	Manager Dashboard - View General Report	
Test Description	Manager will be able view General Reports	
Preconditions	User must be logged in to the system	
Test Steps	Expected Results	Actual Results
1. Click 'General Reports'	Display a list of general reports	Pass
2. Click on 'Report ID'	Display the selected report	Pass

Test Case ID	TC16	
Test Title	Manager Dashboard - View Analysis Report	
Test Description	Manager will be able view Analysis Reports	
Preconditions	User must be logged in to the system	
Test Steps	Expected Results	Actual Results
2. Click 'Analysis Reports'	Display a list of analysis reports	Pass
3. Click on 'Report ID'	Display the selected report	Pass