WfSAT: A Web Based Fish Stock Assessment Tools for Generating Fish Statistical Population Information Using Fish Length Method

Mustafa Man[1], Muhammad Zaidi Zakaria[2] and Fakhrul Adli Mohd Zaki[3]
[1,3]Department of Computer Science,
Faculty of Science and Technology,
Universiti Malaysia Terengganu, 21030 Kuala Terengganu.
[2]Department of Fisheries Science and Aquaculture,
Faculty of Agrotechnology and Food Science,
Universiti Malaysia Terengganu, 21030 Kuala Terengganu.

Abstract - **The aim of this paper is to develop a web based fish stock assessment tools for generating fish statistical population information using fish length methods (WfSAT). FISAT II is currently software on fish stock assessment study has been developed by ICLARM-FAO. This is a standalone software application. WfSAT that we developed is an improvement software application to FiSAT II where the statistical data can be automatically store in centralized database. Data input for WfSAT is done using mobile device on site, where this data automatically sorting into their own interval class of fish length. Procedure for fish population studies will then follow FISAT II application software. Since, this WfSAT is a centralized database, it could be easily analyzed by user in anywhere at any time using internet access. WfSAT also will help the fisheries management authority for generating the statistical of fish population data or information for fish stock assessment analysis and forecasting by using fish length as a main feature data.**

I. INTRODUCTION

Estimating the fish population dynamic where traditionally calculated by spreadsheet (Excel) with resulted a few paper been published in Malaysia [1]. The first computer program using FORTRAN [2] followed by updated version [3]. A computer program using BASIC and programmable calculator were produced by various authors such as [4],[5],[6] and [7] to study the dynamic of fish population in tropical water.

ELEFAN I application software using the BASIC program have been developed by [5] is a first step for present FiSAT II is being used widely by scientific community in tropical countries and found to be the best method available to estimates the population parameters of the fisheries resources even though there exist some doubt on the method been used. The concept by [8] had won a NAGA Award 1999 from his book title "Marine Fishes and Fisheries of Malaysia and Neighboring Countries" which include the information of population parameters using FiSAT II program.

Basically, not much that we could gains from the FiSAT II software since it include a constraint on a yearly cost, labors, and also time consuming especially to collect continuous data in order to understand the dynamics behavior of the fisheries resources. A new solution is needed to counter the problem of fast data retrieval and mining for further analyses of the dynamic of fisheries resources [9].

Therefore, we have developed a software name WiFISH [10] which will incorporate all basic information data on fish landing and fisheries biological data such as length and weight of fish, fish catch, area of fishing and etc using wireless mobile technology.

II. RESEARCH METHODOLOGY

The designs of our research methodology were divided into five phases that is briefly explained below:

1. *Phase 1: Research Study and Data Collection* – this is an initial stage needed for the purposes to evaluate and determine the problem of the research objective. The problem statement is based on the background research and problem. Clear descriptions of the problem were evaluated in order to define the research objective and scope of the study. The collection of basic data such as fish type, fish landing place and time, fish length image etc. need to be done.

2. *Phase 2: Knowledge modeling* – During this phase, the knowledge gained is modeled into understandable steps to be easily presented. Using the gained data, the information is modeled and appropriate data are selected for the design of relational database. It is important to model the data on the database application in order to make sure the applications that are being produced are accurately presenting the actual output. It is so as it is significant to illustrate concept and identifying the entities, attributes, attributes domain and others. There are several steps in modeling a database design process. The first step is to identify the conceptual data types, relationship

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and constraints for Entity Relationship (ER) model. Then, map the conceptual model to logical data model.

3. *Phase 3: Design Prototype* – the prototyping methodology used in modeling the fish stock assessment is based on length. In designing the prototype, all requirements needed are identified. In this phase, it describes desired features and operation in details, including screen layout, business process, pseudo code and other documentation.

4. *Phase 4: Prototype Implementation* – during this phase, the real code is written. All the requirements of the technical stuff in the development will be used. PHP is used as the web scripting language with MySQL as the database server. The done prototype will run through specified configuration and will be evaluated thoroughly according to the requirements defined at earlier phase of prototyping. The prototype is installed on suitable platform on the rapid development environment.

5. *Phase 5: Testing and Evaluation* – in this phase, a special testing environment is provided on purpose of checking for errors, bugs and interoperability. During the evaluation, the prototype is tested in order to make sure it meets the requirements and specified functionality. It also tests the compatibility of the prototype with the platform used to ensure that it can run smoothly. The testing phase involves testing the prototype ability on functionality. The implementation of prototype and testing of the prototype will be carried out repeatedly until the research objective has been fulfilled. If the revised prototype has successfully been fixed, then the final objective has been reached.

III. WFSAT THREE TIER ARCHITECTURE

A. *Three Tier Architecture*

WfSAT uses architecture three layers which comprises of customer layer, application layer database waiter and layer [11]. This architecture can be applied in various forms of systems development generally. WFSAT would emphasize on service and improvement in server application layer (server tier). The design of WFSAT is portrayed in Figure 1 as follows.

1. Client Layer

This layer is an access layer by the system's user either as normal user or as system administrator. Access to web server could be achieved through internet either through wired or wireless. This layer is achieved via a user interface which required username and password as a top safety measure of system access.

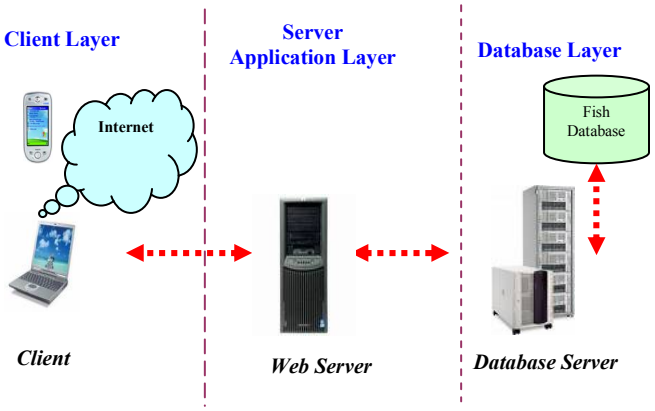

Figure 1. WfSAT Three-Tier Architecture

2. Server Application Layer

This application layer is a very important single layer to manipulate all form of demand by the system user. Information required by customer will be entertained. Multiple applications that were developed shall be deposited in web server and as middlemen for obtaining data from database and will process the data to fulfill user demand. The layer acts as an intermediary application development (Middleware) to enable all information in various forms or format can be connected with database to suit user's requirement.

3. Database Layer

This is layer a pretty important layer where all source of information is stored. Various types and format of databases may be linked to web server. Data input into the database probably will be same or might be different sources. As a result, the database management system should be able to reduce data redundancy. The data kept in this database would be sent to web server if and only if there is a demand from user. The data will be searched by an agent who was developed through intermediary application inside a web server. All data sent will be processed.

IV. SYSTEM DESIGN AND IMPLEMENTATION

The purpose of the analysis and system design is to show how the system will be implemented during the implementation phase. The system that will be developed should be able to carry out tasks and functions that have been mentioned in the use-case description, fulfilling the needs and be well structured for future changes whenever functional changes are needed.

A. Design

Design is the steps that will be carried out after identification of primary functions of the systems. The entire requirement will be analysed and translated into application components. The data entered into the system will be stored into the primary database. A good database will result in a high-quality system in terms of accessing time and also data updating processes.

B. Implementation

The implementation of the software is the most important phase in the development process of a system. The implementation phase is carried out by referring to the design phase to produce an organized user-interface in various aspects.

In the implementation part of the system, description of each module in WfSAT which is login module, maintain user information, key in the data fish length, and generate graph report. The entire module is doing by user following the access level administrator, officer and fishermen as user of the system.

1. System Log-In

Figure 2 shows the correct screen for the user to log into WfSAT system. Users are required to enter by entering their usernames and passwords.

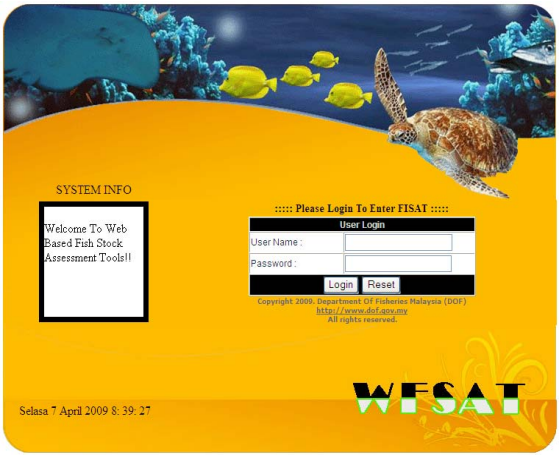

Figure 2. Login Interface

2. Registrar Module

When an administrator logs in, the main menu display screen as shown in Figure 3 to Figure 7 will be displayed.

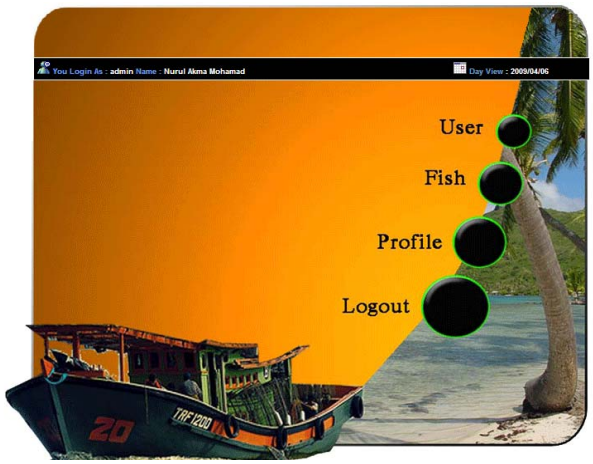

Figure 3. WFSAT Administrator Interface

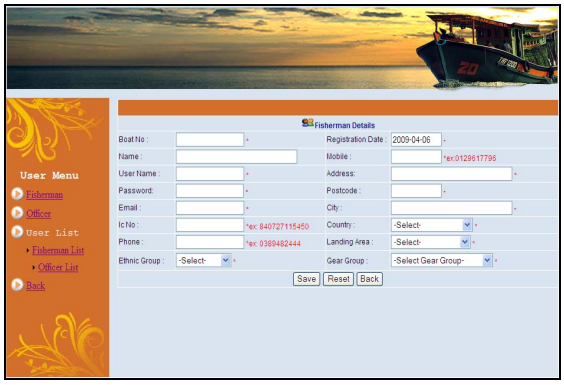

Figure 4. Registration User Interface

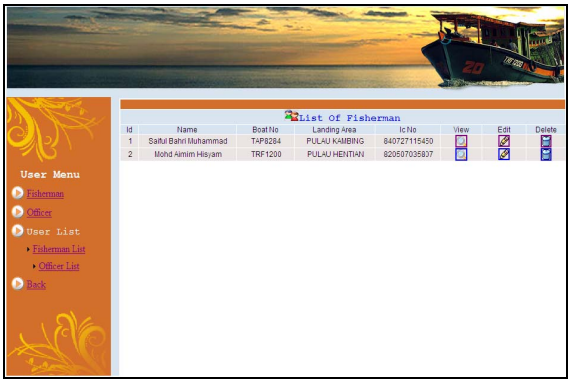

Figure 5. Update User Information Interface

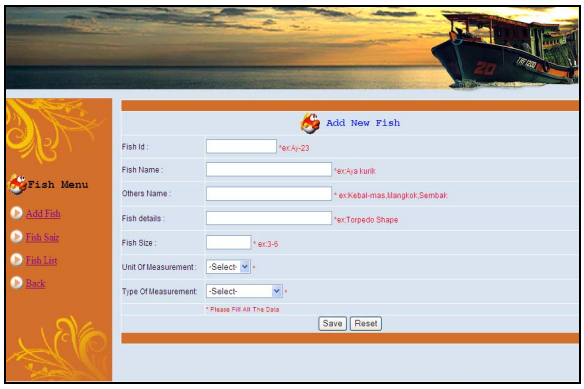

Figure 6. Registration Fish Information Interface

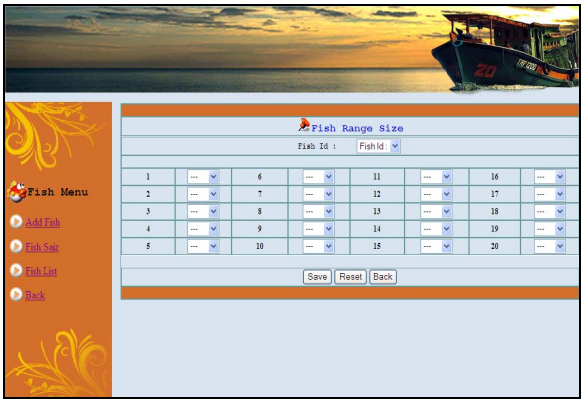

Figure 7. Registration Fish Range Size Interface

3. Setting Input Fish Species and Length Data

When a Department of Fisheries (DOF) officer administrator logs in, the main menu display screen as in Figure 8 to Figure 9 will be displayed.

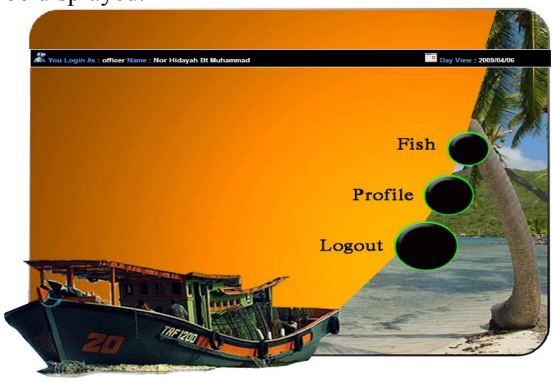

Figure 8. DOF Officer Interface

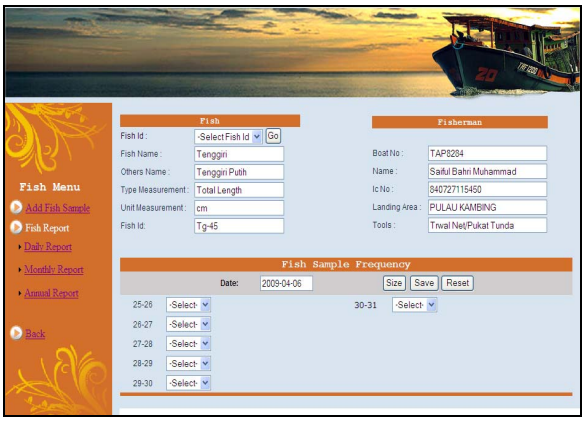

Figure 9. Frequency Fish Length Interface

4. Generate Report

When a users logs in, the main menu display screen as shown in Figure 10 to Figure 14 will be displayed.

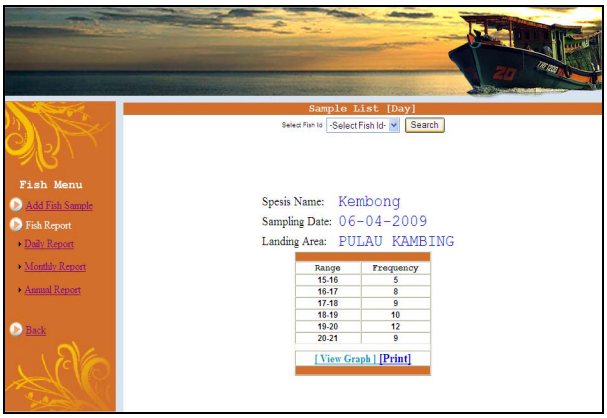

Figure 10. Search Daily Report Species Date and Landing Port Interface

Figure 11. Daily Graph Report by species and landing port Interface

Figure 12. Search Monthly Report by Species and Landing Port Interface

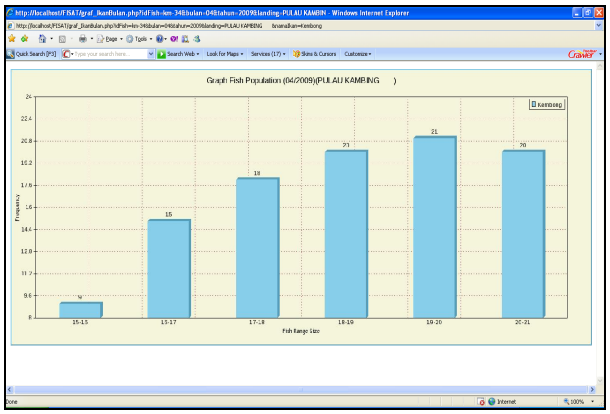

Figure 13. Monthly Graph Report by Species and Landing Port Interface

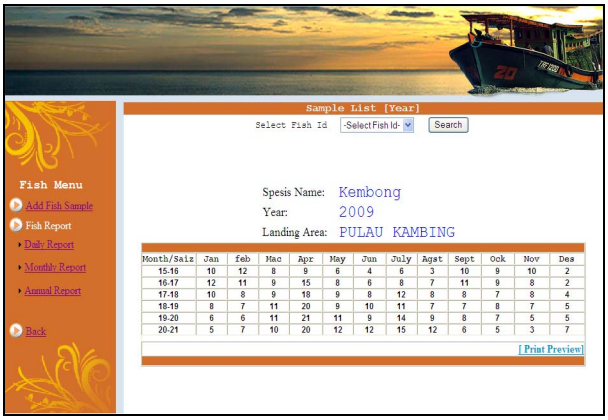

Figure 14. Search Annual Report by Species and Landing Port Interface

V. DISCUSSIONS AND CONCLUSION

A. Discussion

System WfSAT offers several advantages over the existing system. The most obvious advantage is the web platform on which this system is operating on enables anytime, anywhere access for the users. The web-based platform also reduces installation costs for the organization.

The system also provides standard security features such as entry authorization by password and unique access levels for different user types. Therefore, automatically the system can identify users who logged in. WfSAT will generate report in graph format which will be easy for user to construct a comparison and more graphical report.

This system has the potential to be expanded and enhanced. System development, if the need arises, should be increased in scope especially about using the *short messaging services* (sms) via the mobile phone.

B. Conclusion

With the completion of WfSAT system, it is expected to manage a problem in controlling fish stock to be more efficient and systematic based on standard that has been approved. The system development required careful planning and correct analysis to ensure the validity and verifiability of the system.

Therefore, correct choice of methodology plays a crucial role in developing the system. Hence, Reverse Engineering as accepted development methodology is chosen. Reverse Engineering is able to provide the developer a greater insight on the system architecture. Finally, it is hoped that this development project proves to be a good experience for the developer to enter the real industrial world.

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