

# APDATI: E-FISHING LOGBOOK FOR INTEGRATED TUNA FISHING DATA MANAGEMENT

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## ABSTRACT

It is an absolute requirement for the fishing industry to have a management system in order to increase the productivity and the competitiveness in the fishing industry, specially in Indonesia. In this paper we proposed to develop an ICT based integrated tuna fishing management system: E-Fishing Logbook APDATI. The system encompasses all the business process in the fishing industry, start from logging the fishing, licensing, fishing monitoring until the export licensing to the other countries. The system should accommodate all the stakeholders in the fishing industry which are going to be the user of the future system. They are the Minister of The Marine Affair and Fishing (MMAF), the fishing company and the fishing ships. Based on the integrated architecture system proposed in the previous study, we developed the system in two platforms, the web based system and the mobile based system. The development methodology for both systems start from the user requirement analysis until the application design that meets the requirements based on the business process identified. Of all the stages conducted in the system development, we have succeeded to design a well suited integrated tuna fishing data management system that contribute to the development of the Indonesian Fishing Industry.

**Keywords:** *E-Fishing Logbook, Fishing Data Management, Mobile Documentation, Android Application, Indonesia*

## 1. INTRODUCTION

In recent years, the Indonesian fishing industry is more developed. It is proven that Indonesia has become one of the largest fishery producer countries based on the FAO Year Books [1]. The development of the fishing industry in Indonesia indeed can not be separated from the role of technology in building and developing the existing business processes. In this case, the technology directly involves in the fishing process, the management of the fish distribution and sales.

As mentioned in our previous study [2] that Indonesia needs an ICT (Information and Communication Technology) based integrated fishery industry management for all the stakeholders involved. The role of the integrated data management is expected to be the key to the fish availability and a good monitoring for the MMAF, in addition, it can also maximize the potential of existing fishing industry. Thus, it can

lead the Indonesian fishery industry to be more developed and more mature.

The implementation of ICT in the fishery industry can be seen in several countries such as Taiwan which has already using a Vessel Monitoring System (VMS) to monitor the fishing ships [3] and Taiwan also has already another system which connect to the fishing regulation system. Philippines was assessed using FISHDA (Fishing Industries' Support in Handling Decisions Application), a simple decision support tool which requires minimal or easily-generated data [4].

In Indonesia the monitoring system by the MMAF for the fishing ships has already been implemented. The MMAF also enforces procedures and regulations to dispart the fishing area or commonly called Wilayah Penangkapan Perikanan (WPP). The fishing permission to get the ship to the fishing location will be monitored by the MMAF by utilizing the VMS. The MMAF also has a significant role in the export system, the minister endorses the export document based on the VMS

report. While the VMS only monitors the fishing ship location, the information needed is more than just the location. The MMAF also needs the aggregate number of the fishing caught and the type of fish of the fishing area. In order to obtain such information, the MMAF should have examined different documents and reports.

Based on the previous study regarding the process business of the fishing industry, it is known that the available system is unintegrated. The MMAF and the fishing companies do not share the same system to handle the licensing and so on. Based on this situation, there are some impressions that the monitoring is very difficult to do from the MMAF side and from the fishing company side it is so difficult to have a transparent licensing process. We can conclude that an ICT systems is required to accommodate all the stakeholders' needs so that all the stakeholders can contribute most to the fishing industry. One of the application identified in [2] is the integrated data management application that is able to assist the documentation of the fishing (fishing location and the number of fish caught). In addition the system also enables the stakeholders to interact in the process of licencing and monitoring. Therefore, the ICT based integrated fishing data management can be utilized as the solution to the difficulties encountered by the stakeholders.

In this paper we contribute a design of the ICT based integrated fishing data management system that is introduced in [2]. Our design consists of three parts; database design, application design and user interface design. Aside from the design, we also introduce some of the challenges in order to successfully implement the system in the future time.

The paper is organized into 6 sections. Section 1 is the introduction of the paper, section 2 consists of the previous study relating to the fishing management and regulations. Section 3 is about the proposed integrated business process for tuna fishing data management. Section 4 consists of the design of the E-Fishing Logbook APDATI. Section 5 is the challenge of the implementation of the E-Fishing Logbook APDATI and the last section 6 is the conclusion of our study. This guide provides details to assist authors in preparing a paper for publication in JATIT so that there is a consistency among papers. These instructions give guidance on layout, style, illustrations and references and serve as a model for authors to emulate. Please follow these specifications closely as papers which do not meet the standards laid down, will not be published.

## 2. PREVIOUS STUDY

From the previous study, it can be seen that the fishing data management has many limitations particularly in the conventional fishing logbook. The study also identified numbers of drawbacks from this method of documentation [2]. Huang and Chuang proposed a study about fishing monitoring utilizing the VMS (Vessel Monitoring System) in Taiwan [3]. This method can only monitor the position of the fishing ships. The information about fish and the number of fish caught is still unknown. Muallil et al. proposed a simple decision support tool which requires minimal or easily-generated data [4]. It is implemented in Philippines and this application was assessed using FISHDA (Fishing Industries' Support in Handling Decisions Application This application is really useful in determining the potential area to do fishing. It is intended to preserve the number of fish in certain area and prevent the extinction of certain species of fish. Falco et al proposed an integrated observer system [5], it deals with the observation of the fisheries and the oceanographic data. The Fishing Observing System (FOS) utilizes some dependent parts including: electronic logbook, a GPS, and temperature and pressure recorder. By this mean, we can see that the logbook can be integrated with another data for the monitoring purpose. The system needs some representational data, which are FOS data collection, and the environmental data. However there is still unclear information regarding to what kind of the electronic Logbook is, and how it works. Generally all regulations presuppose the VMS in all the fishing ships to explore the space point of view in case of solving the illegal, unreported, and unregulated fishing. The implementation of integrating the LOGBOOKS data and the VMS data has been done by Bastardie et al [6]. The LOGBOOKS data are then merged with VMS in order to get the prediction and concerning about the mismatching data between the possible misreporting of areas and catch dates in fishermen's logbook declarations. In this case, we can see that the importance of the LOGBOOKS information validity takes high attention since it is one of the main data resources. Study proposed by Fitriannah et al [2] introduced an integrated architecture system in managing the fishery industry not only for the fishing company but also for the government (MMAF) and accommodate both needs in the process business.

For further understanding about each study, we provide a table of pluses and minuses in Table 1.

Table 1. Comprison Of Previous Study In Fishing Technology

Literature	Proposed by	Advantages	Drawbacks
VMS	Huang and Chuang	To have the information about the exact location of the fishing vessel	It is rather difficult to have the data analysed with other data to generate new information
FISHDA	Muallil et al.	<ul style="list-style-type: none"> <li>Useful in determining the potential area to do fishing.</li> <li>It is intended to preserve the number of fish in certain area and prevent the extinction of certain species of fish.</li> <li>This application requires minimal data</li> </ul>	-
Fishing Observing System (FOS)	Falco et al.	the logbook can be integrated with another data for the monitoring purpose	there is still unclear information regarding to what kind of the electronic Logbook is, and how it works
Integrated Logbooks and VMS	Bastardie, et al.	to get the prediction and concerning about the mismatching data between the possible misreporting of areas and catch dates in fishermen's logbook declarations	-
Integrated architecture system in managing the fishery industry	Fitriannah et al.	<ul style="list-style-type: none"> <li>Introduce the framework system that accomodate both the government and the fishing companies</li> <li>Utilizing the e-logbook</li> </ul>	-

		as means of monitoring and documentati on	
		<ul style="list-style-type: none"> <li>Integrating the monitoring and documentin g parts with other fishing business processes</li> </ul>	

### 3. PROPOSED INTEGRATED BUSINESS PROCESS OF APDATI E-FISHING LOGBOOK

The current system that is available to monitor the fishing activities in Indonesia is based on the VMS (Vessel Monitoring System). The system as it is stated in the literature review has many drawbacks. As the Indonesian government has a commitment to increase the fishing industry, such monitoring approach will not be sufficient. Based on the MMAF strategic plan [7], Indonesia needs more sophisticated technology supports in order to enhance the process in the fishing industry.

This paper proposed a design of E-Fishing Logbook called APDATI which is an integrated system that functions as fishing management system in an ICT based integrated system. Basically the system is based on two main platforms, the android based platform and the web based platform.

The android platform is required for the fishing trip documentation. We require an android based system because it is an open source system and it comes in many hardware choices [8]. It needs the mobile application system that can cover the direct input of the fishing trips and the amount of the fish caught. Therefore, the updated data about number of fish being caught and ship location is easy to be accessed either by the fishing company or by the MMAF. The other platform is the web based platform that covers both sides for the fishing company and the MMAF.

To be able to identify the components from the system proposed, we had to analyze the process business in the fishing industry. Based on [2] there are 3 stakeholders in the industry, the MMAF, the fishing company and the fishing ship. There are 4 main processes in the industry as in Figure 1, they are fishing activities licensing, fishing activities monitoring, fishing activities documentation and fish export licensing.



Figure 1: The Main Process In The Fishing Business Process [2]

Based on the main business process, we describe the processes in a detailed way. The sequence of the whole business process is in Figure 2.

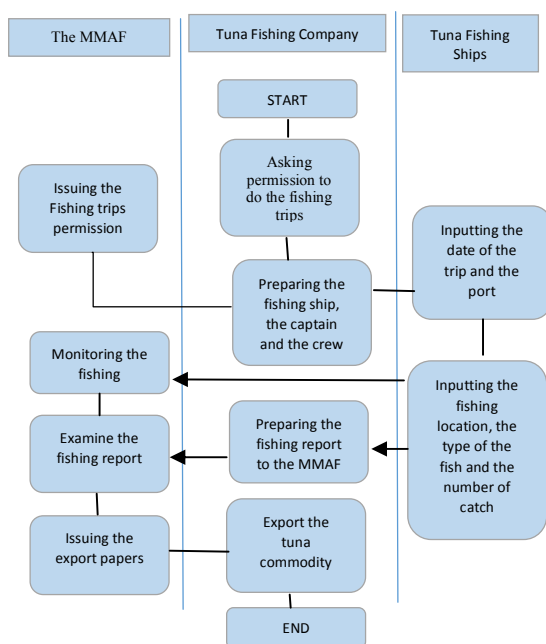


Figure 2: Flowchart Of The Tuna Fishing Business Process

It starts from the fishing company asking for the fishing license to hold a fishing trip. The permission is submitted to the MMAF. If the permission is granted, the fishing permit will be then issued by the MMAF and furthermore, the fishing permit is used by the ship captain as the official travel documents. Next is, the company set up all the preparation for the trip. After the preparation is all set, the captain starts the trip from the port and initialize all the information needed before departing.

During the trip, the captain inputs all information regarding the fishing trip such as the fishing location, number of the fish caught per type of fish. This process is utilizing the android application. Since it is online, the information can be accessed by either the fishing company and also the MMAF. The MMAF can take advantages from this application by monitoring not only the fishing location but also the number and fish type being

caught. The transparency of the system provides the fishing company a facility to report the fishing trips to the MMAF in advanced.

The export license will be issued following the end of the fishing trip. The export license is utilized by the company as the official tuna export documents to other countries.

Other functions of the E-Fishing Logbook APDATI for both the MMAF and the fishing company are served by the web based application. After finishing the analysis of the process business, next step is designing the E-Fishing Logbook APDATI

#### 4. DESIGN OF THE E-FISHING LOGBOOK APDATI

The design of the E-Fishing Logbook APDATI is divided into 3 stages. The database design, the application design and the user interface design.

##### 4.1 Database design

Based on the business process analysis, we gathered all the information from fact finding. We found that the system required some information regarding the ships, the fishing companies, the fishing trips, the captain and the information about the catch. The comprehensive design of entity relationship diagram on the database for the E-Fishing Logbook APDATI is illustrated in Figure 3.

##### 4.2 Application design

The application consists of 2 parts. The first part is the android based mobile application and the other part is the web based application. The first part, the mobile application is utilized for the fishing documentation and the fishing monitoring, while the second part functions as the intermediary application for both the MMAF and the fishing company.

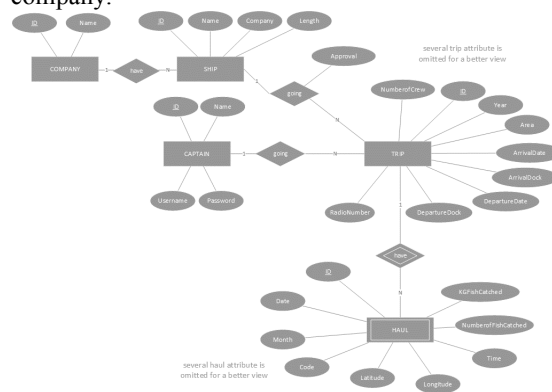


Figure 3: Entity Relationship Diagram Of The Database Design

4.2.1 Mobile based application

Since the E-Fishing Logbook APDATI is needed for documenting the fishing trips and the information about the fish caught during the fishing trip, so we need an application with the mobile platform. To overcome the coverage problems, the mobile application is designed to have a temporary file feature so that it will allow the data to be sent to the database server just in time when the coverage of the service network is available. The mobile based application architecture is illustrated in Figure 4.

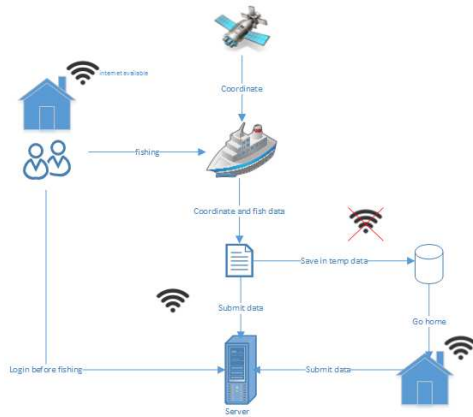


Figure 4: Mobile Based Application Architecture

With this method of documentation, the application enables the company to have an updated real time data about the number of fish caught, furthermore the MMAF at the same time can monitor the trips of the fishing ships. The design of the mobile application is in Figure 5. The user of the application is the captain of the ship. The application will have 5 functions, login and logout of the system, managing the data trip, managing the logbook information and submit the data.

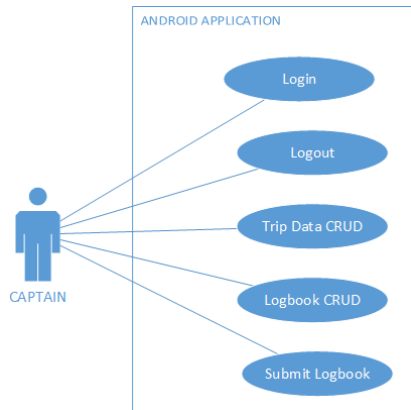


Figure 5: Functionality Design Of Mobile Based Application

4.2.2 Web based application

The web based application is basically serves as an intermediary application for both the fishing company and the MMAF. The functions cover the monitoring, licensing the fishing trip and licensing the tuna export. The web application is also connected with the mobile application database server to share the fishing trip information. For more details, the design can be seen in Figure 6 and 7.

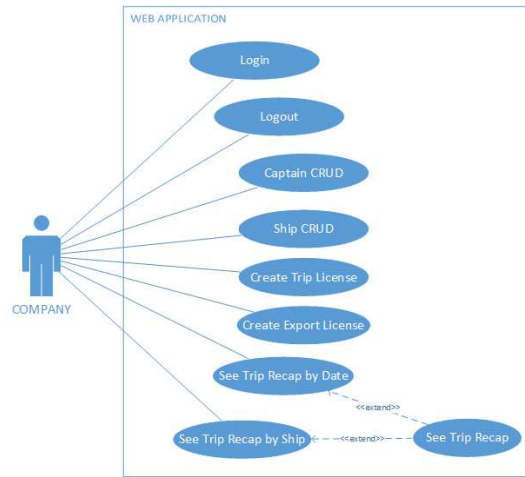


Figure 6: Functionality Design Of Web Based Application (Company Role)

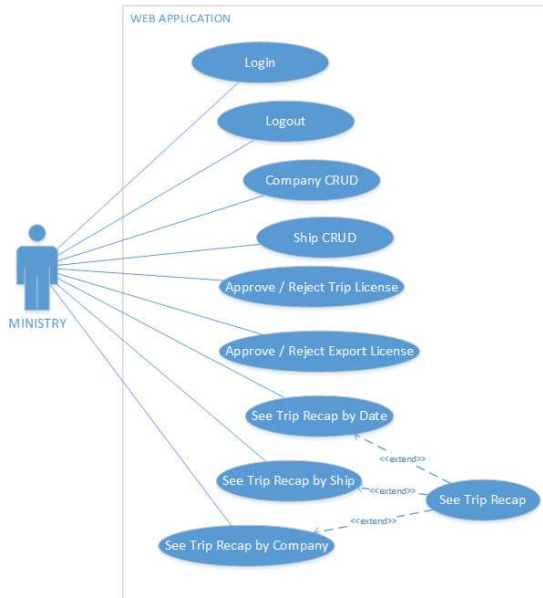


Figure 7: Functionality Design Of Web Based Application (MMAF Role)

From Figure 6 and 7 we can see that the fishing trip report is generated automatically by the application. Use case See Trip Recap for user ministry extends to See Trip Recap by Date, See Trip Recap by Ship and See Trip Recap by Company. It means that the MMAF can take a comprehensive monitoring for all the fishing trips.

### 4.3 The User Interface Design

In order to develop a more efficient and simpler application for users, we design the user interface based on the Graphical User Interface (GUI). For the mobile based application we design a shallow menu and clear field instruction to provide the user convenient access [9]. The information is clustered based on the tasks. Trip data, logbook data and submission. The fishing location also can be viewed in a simple map. The details of the user interface design for mobile based application are illustrated in Figure 8 until Figure 12.

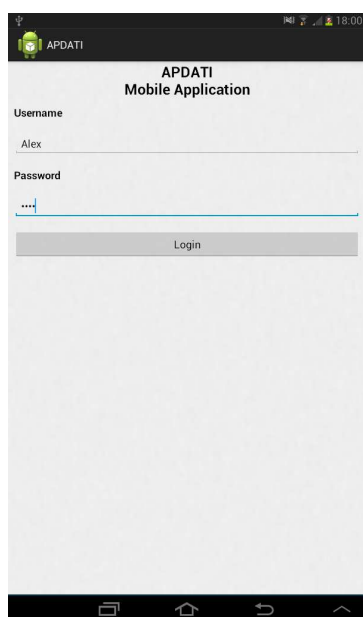


Figure 8: Login Menu In Mobile App



Figure 9: Home Menu In Mobile App



Figure 10: Trip Data Menu

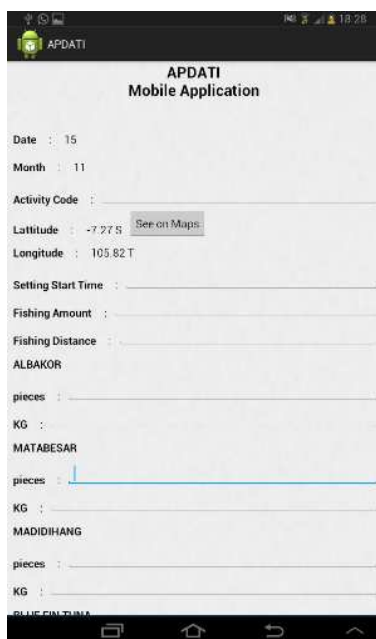


Figure 11: Submit Daily Menu

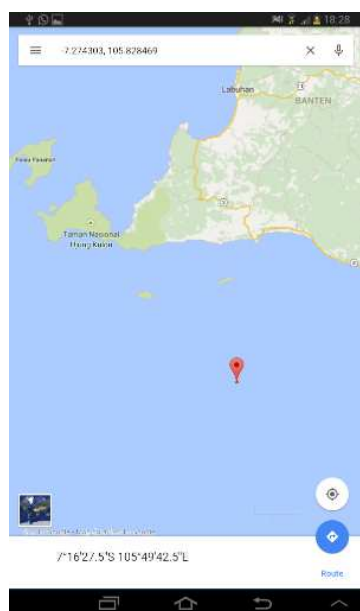


Figure 12: Map Of Fishing Location

As in the mobile based application, the user interface design for the web based application is also designed in efficient and simple user interface.

Web based application for the MMAF has 7 sub menus as in Figure 13.

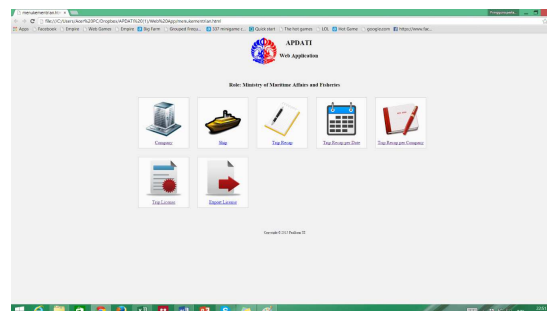


Figure 13: The Web Menu Of The MMAF Role

The menu that enables the MMAF to monitor the fishing activities of all the fishing company is in sub menu Trip Recap Per Company in Figure 14. It also can be used for the report when making a decision on the export licensing as in Figure 15.

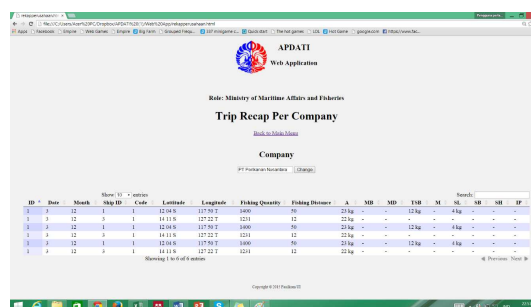


Figure 14: The Trip Recap Per Company Menu

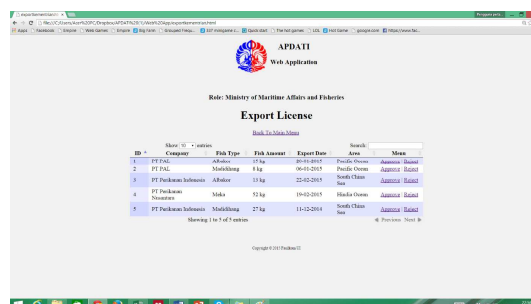


Figure 15: The Export License Decision Menu

The user interface design for the fishing company is closely similar to the one in the MMAF design except for the sub menu Trip Recap Per Company.

The fishing company has to request a new licence whether a trip license or export license. The request form of the fishing trip is in Figure 16. From this figure we can see the trip license status. It can be either rejected, waiting for approval or

approved. Once the license is approved, the company can print the documents for further official travel documents. The processes are also applied for the export license process.

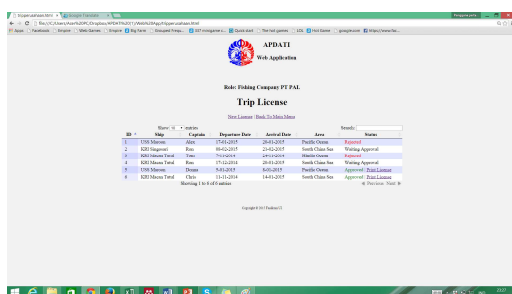


Figure 16: The Trip License Request Menu

Furthermore the MMAF and the fishing companies can communicate and share trip information through this integrated system.

## 5. CHALLENGE OF THE E-FISHING LOGBOOK IMPLEMENTATION FOR THE MMAF

In order to successfully implement IS/IT systems, organisations must be aware various challenges and obstacles, so that they can take some actions to mitigate their impacts [9, 10]. Thus, it is required that organisations know critical success factors (CSFs) of IS/IT implementation that may differ projects to projects [11]. E-Fishing Logbook APDATI is aimed to integrate both the government (the MMAF) and the fishing companies from the private sectors. Implementing such an application may impose some challenges, which can be categorized into five issues namely: leadership issue, management process issue, organization environment issue, technical system issues and personnel issues [9]. Therefore, in this paper we outline some challenges that should be considered when implementing the E-Fishing Logbook APDATI. We adopted the challenge implementation issues taken from [12] and combined with our CSFs from our previous study [13] for framing our idea.

### 5.1 Leadership Issues

Some drawbacks of the leadership in most of ministries in Indonesia and many large organizations are inefficient top level leadership, a hierarchical leadership style and tend to have less supervision [10], whereas it has been proven in some previous research in Indonesia [11][12] that

leadership is one of key success if e-government implementation. Therefore, in order to have E-Fishing Logbook successfully implemented, it needs the support of the leader, in this case is the MMAF, so that all fishing companies will use the E-Fishing Logbook APDATI. Thus, one of the challenges is to convince the MMAF about the benefits of E-Fishing Logbook APDATI implementation for fisheries management in Indonesia. When E-Fishing Logbook APDATI gains support from the MMAF, other aspects will follow as the MMAF serves as regulator where all stakeholders should comply to government regulations.

### 5.2 Management Process Issues

One of the challenges in the management process is developing a strategic plan as a blue print of organization activities. Fortunately, the Ministry of Marine Affairs and Fisheries Indonesia has already a strategic plan [7], in which one of its strategies is to have IT systems to support the fisheries management in Indonesia. In addition, our government puts their concern to the maritime related programs, thus E-Fishing Logbook APDATI seems to fit our government concerns. Therefore, we consider management process is not a big issue in E-Fishing Logbook implementation.

### 5.3 Organisation Environment Issues

Most of crucial environmental issues in Indonesia is related to the political issue. The political climate in Indonesia, which consists of many parties, causing often an e-government initiative was not supported if it does not add economic values to the party. Implementation of E-Fishing Logbook which has a strategic value in the current government may lead to competition among political parties, as they do not want our government succeeded in carrying out its functions.

### 5.4 Technical System Issues

We have identified a critical technical issues regarding the implementation of E-Fishing Logbook in Indonesia. The geographical condition of Indonesia, which consists of thousands of islands, whereas the fishing activities usually occur in remote location with less IT and telecommunication infrastructures. Our government through the Minister of Communications and Informatics have made a serious effort to integrate all the main islands (Sumatera, Jawa, Kalimantan, Nusa Tenggara, Papua, Sulawesi, dan Maluku) utilizing an The Palapa Ring Infrastructure Project, however the coverage is still not sufficient yet for



the outer islands. Thus it is still a challenging task or almost impossible to have IT and telecommunication infrastructure that cover all areas in Indonesia, both land and sea.

### 5.5 Personnel Issues

According to the United Nation Development Program, the Human Development Index for Indonesia is in rank 108 out of 187 countries [13]. The e-logbook implementation requires people to have IT literacy, which may be challenging for ship crews.

## 6 CONCLUDING REMARKS

### 6.1 Conclusion

APDATI, the E-Fishing Logbook for integrated tuna fishing data management is one of the implementations of the Integrated Framework Tuna Fishery Data Management. The application system design introduced in this paper is based on the business process and therefore it is aligned with the user requirements. Based on the requirements for both mobile based system and web based system have gone through the stages conducted in the system development. We have succeeded to design a well suited E-Fishing Logbook for integrated tuna fishing data management system that contributes to the development of the Indonesian fishing industry. In addition we also have identified some of the challenges of the system implementation in the future, so that the MMAF becomes more aware of the things that can hamper the E-Fishing Logbook implementation.

### 6.2 Limitation of Study

The requirements of application in this study is identified from 2 resources; the MMAF and a tuna fishing company. To deliver a good application design based on the user requirement, it is necessary that the resources must cover all stakeholders in the industry including the other fishing companies.

### 6.3 Future Works

The future works of this study will be in developing an intelligent system to determine the tuna potential fishing zones. The system will utilize the data gathered from this documentation application. Combined with necessary oceanographic characteristics, the system will generate a fishing ground mapping for tuna production. In addition, we would like to explore the possibility of using cloud computing

technology, as many industries feel benefit of it. [14], [15].

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