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The Development of Web-Based Forestry Management Information System

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Abstract. The most crucial part in the development of forestry information system is collecting the required forestry data to fulfill the standards set by the Regulation of the Minister of Forestry of the Republic of Indonesia Number: P.02 / Menhut-II / 2010 on Forestry Information System. This process is done manually, and the results are not stored in single storage that leads to data redundancy and time wastage. Therefore, this study aimed to design a web-based Forestry Management Information System that will be named as SeMUT. This system was built to reduce the data redundancy and simplify the management of the required supporting documents. Besides, SeMUT is expected to become the data center of the East Kalimantan Provincial Forestry Office. The development of SeMUT utilized the waterfall model of System Development Life Cycle (SDLC) method that has five main stages, including requirement analysis, design, implementation, testing, and maintenance. This research is expected to be able to propose a web-based forestry management information system which enhances the effectiveness and efficiency of forestry data compilation. This research has developed an application that is useful for collecting data centrally.

1. Introduction

The information technology is growing rapidly that enables people to get the information via internet easily. Information technology is used in data processing, data acquiring, data organizing, data storing, and data manipulating to produce high quality, fast, accurate, and timely information. Forestry information system is forestry data management activities which includes collecting, processing and presenting data digitally [1]. Forestry information system refers to the Regulation of the Minister of Forestry Republic of Indonesia Number P.02/Menhut-II/2010 on Forestry Information Systems. The configuration of the forestry information system is done by collecting the necessary data to fulfill the tables that have been assigned by the Ministry of Forestry[2].

Several problems that often occur during the development of forestry information system are data redundancy, information decentralization, and the limited time that allocated to collect the data of forestry information system. In addition, data arrangement in forestry information system is still fragmented (not stored in one storage) and is done manually. As the consequences, the searching and collecting data processes become more difficult and time consuming.

The utilization of technology in the form of system information implementation enables the development of the forestry information system to be more automated without eliminating the processes that have been run over the years. Therefore, this research proposes a web-based forestry information system called Forestry Management Information System (Sistem Informasi Manajemen Kehutanan/SeMUT). Web-based application is expected to simplify the process of data collection, so it will be easier to detect which data tables that has not been filled by the Forest Management Unit (Kesatuan Pengelolaan Hutan/KPH) in East Kalimantan Province.



According to Article 12 of the Forestry Law [3], forestry planning includes: forest inventory, forest area reinforcement, forest area stewardship, the establishment of forest management areas at the provincial, district/city and Forest Management Unit. Forest Management Unit is the smallest management unit according to its main function and designation, which can be managed efficiently and sustainably. It can be in the form of Protected Forest Management Unit (Kesatuan Pengelolaan Hutan Lindung/KPHL), Production Forest Management Unit (Kesatuan Pengelolaan Hutan Produksi/KPHP), and Conservation Forest Management Unit (Kesatuan Pengelolaan Hutan Konservasi/KPHK) [4].

Based on these considerations, the objective of this study is to develop a web-based forestry management information system that serves as a data centre and it capable to produce the softcopy and hardcopy report in accordance with the format of the Regulation of the Minister of Forestry of the Republic of Indonesia Number P.02/Menhut-II/2010. The development of the Forestry Management Information System, that will be named as SeMUT, is using the steps contained in the System Development Life Cycle (SDLC) method by adopting the waterfall model. The resulting system is expected to help reduce data redundancy and time wastage in the preparation of the forestry information systems.

2. Materials and Methods

The development of SeMUT utilized the waterfall model of SDLC method. This method has 5 main stages including requirement analysis, design, implementation, testing, and maintenance [5]. The explanation of each stages are as follow:

- a) Requirement analysis, selecting the necessary devices in the development of SeMUT which include hardware and software.
- b) Design, this stage is divided into several processes, namely the system design, database design, and system display design. The system design includes the process of collecting data through observation and interviews. The next step is designing the database used in the system. The design of the system display serves as a reference to create a user interface for system implementation, which includes the design of the user login page and main page.
- c) Implementation, at this stage, the designs that have been made is implemented. The implementation should be as close as possible to the design so that the system is made in accordance with the objectives of the system and user requirements.
- d) Testing, system testing is done by uniting the program units and then tested as a whole.
- e) Maintenance, maintain the system that has been built.

3. Results

As the first step of the system development, the requirement analysis of hardware and software which are needed by the user are shown in Table 1 and Table 2 below.

Table 1. The minimum specifications of user hardware

No	Hardware	Specification
1	Processor	Intel Core i3 4.0 GHz
2	RAM	2 GB
3	Hard Drive	100 GB

Table 2. The minimum specifications of user software

No	Software	Specification
1	Operating system	Windows 7
2	The browser application	Mozilla firefox and Google chrome

After the requirement analysis, we performed the system design which has been done by collecting data through observation and interviews. The observations were carried out to obtain the required data for forestry information system tables. The interviews were conducted to the East Kalimantan Provincial Forestry Office. The outcome of this process was depicted into the Data Flow Diagram

(DFD) Level 0 as shown in Figure 1. The DFD Level 1 is shown in Figure 2 which illustrates the data flow, data storage, and data output. Furthermore, the DFD also displays the data flow and the underlying processes in SeMUT.

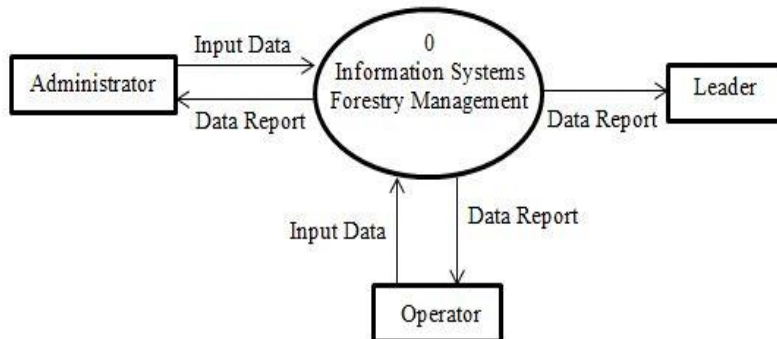


Figure 1. Data Flow Diagram Level 0

Figure 1 depicts the data flow, data storage, and data output as well as users involved in the system, including administrators, superintendences, and operators.

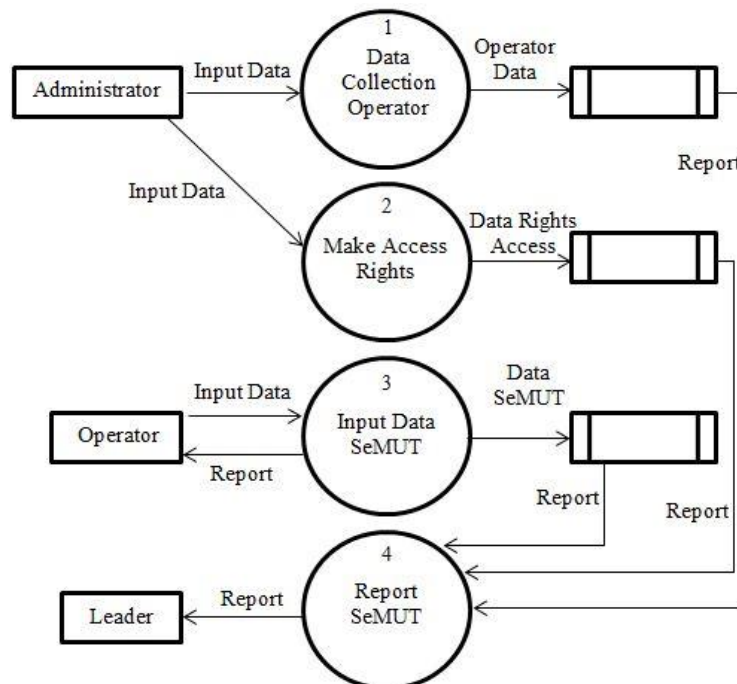


Figure 2. Data Flow Diagram Level 1

Figure 2 illustrates in detail the system processes within the system, including the operator data process, the registration process of operator access rights, the system data input, and the report of system recapitulation.

At the implementation stage, the design that has been created was applied using several applications and programming as follows:

- Notepad ++ as a text editor.
- CodeIgniter, an open source application in the form of a PHP framework with an MVC (Model, View, Controller) model for building dynamic websites using PHP.
- PHP and javascript as programming languages.
- MySQL as data storage or database server.

The display of SeMUT login page and user menu page can be seen in Figure 3, 4 and 5.



Figure 3. Home Login Display

Figure 3 displays the main page in which the users ought to log in first to be able to access the system.

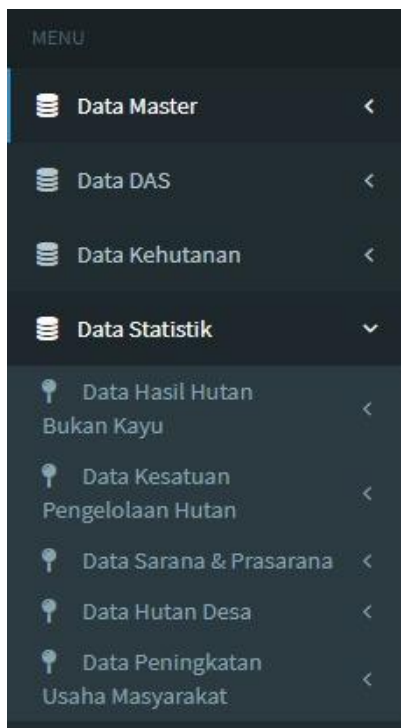


Figure 4. User Menu Page Views

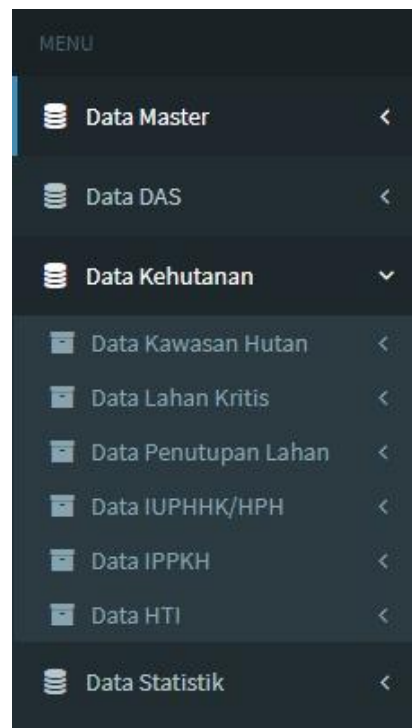


Figure 5. User Menu Page Views

Figure 4 and 5 shows the data menu page of SeMUT

After the system has been implemented, we performed testing that was done through the validation testing to observe whether the system has been running as expected. The system testing was undertaken on the registration process of the application users, the data input of forestry information system, the searching process of forestry data, and the outputs of the forestry information system. After each of the process has been tested, the result obtained that every test case was in accordance with the expected result, which means that it has been valid with the validity level up to 100%.

4. Conclusion

This research has proposed a web-based forestry management information system that enable the enhancement of the effectiveness and efficiency of forestry data compilation. The Forest Management Information System (SeMUT) can be functioned as a data center, and produce both hardcopy and softcopy documents. The development of SEMUT adopted the waterfall model from SDLC method but only for the 4 stages, namely requirements analysis, design, implementation and testing. Several applications and programming used in this development include Notepad ++, Codeigniter Framework, PHP and MySQL. Web-based SEMUT has been able to be operated using a web browser (Mozilla Firefox, Google Chrome) that utilize the forestry data in 2018.

5. Suggestion

This research would like to deliver several useful recommendations to improve the system performance. First, the display of the forestry management information system interface should be more attractive and user-friendly. Therefore, it is necessary to perform the usability testing for the upcoming research. The forestry data and information contained in SeMUT can be added, not only refers to the Regulation of the Minister of Forestry of the Republic of Indonesia Number P.02/Menhut-II/2010 so it can be used more broadly.

6. Acknowledgments

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