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The Use Of E-Reservation Open-Source Software (OSS) On Web-Based Laboratory Scheduling Information Systems In Order To Support Education Laboratory Management

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Abstract. Good laboratory management is needed to improve laboratory efficiency and effectiveness; one component of laboratory management is the use of laboratories. Laboratory use problems arise when there is a schedule change or a schedule conflict occurs since the management is still done manually, causing long automation and the lack of information on the laboratory's availability, this can certainly hamper teaching and learning activities in the laboratory. To overcome this, it is necessary to have a system which can provide information on the availability of an effective laboratory and faster automation, one of which is by using the open-source software e-Reservation Meeting Room Booking System. It is a PHP and MySQL-based room reservation information system that can be used for laboratory scheduling and providing information on laboratory availability.

Keywords: Open-Source Software, e-Reservation, Meeting Room Booking System, Scheduling, PHP and MySQL.

1 Introduction

Educational laboratories according to the Regulation of Ministry of Empowerment of State Apparatus and Bureaucratic Reform Number 3 of 2010 concerning Functional Positions of Educational Laboratory Institutions and their Credit Scores are academic support units in educational institutions, in the form of closed or open rooms, permanent or mobile, managed systematically for testing, calibration, and/or activities. production on a limited scale, using equipment and materials based on certain scientific methods, in the context of implementing education, research, and/or community service. [1]

Laboratory management is an inseparable part of laboratory activities. To improve the efficiency and effectiveness of the laboratory and to achieve the objectives of the laboratory as a learning resource, good laboratory management is required. One aspect that is included in the management of the laboratory is the preparation of the laboratory schedule. The preparation of laboratory schedules is important because it is related to the schedules of lecturers and laboratory assistants, but in reality, there are still many obstacles in its management, especially those that are done manually. The following are some studies that discuss the constraints found in the manual scheduling system:

1. Research conducted by Haifan, et al entitled Practicum Scheduling System Using Genetic Algorithms states that "The process of making schedules is done by manually matching, causing problems such as conflicting schedules and students being placed in different rooms at one time". [2]
2. In a study written by Suratno entitled Building a Scheduling Information System Using Genetic Algorithm Methods at the Informatics Engineering Laboratory, University of Muhammadiyah North Maluku, it was stated that "Manual preparation of schedules tends to take longer and with sufficient accuracy". [3]

3. Further research entitled Web-Based Laboratory Scheduling Information System (Case Study: South Aceh Polytechnic Multimedia Laboratory) written by Asmaidi stated that "The schedule has become less focused and requires repeated revisions, due to the concurrent schedule". [4]
4. Research conducted by Nadhirah entitled Application Design of Basic Physics Laboratory Scheduling System at Gunadarma University stated that "Manual scheduling is complicated and takes a long time because many factors must be considered". [5]
5. Furthermore, the research conducted by Nata entitled Analysis and Design of Practicum Scheduling Management Information Systems Using Genetic Algorithms at the Laboratory of the Faculty of Agricultural Technology, University of Jambi stated that "Practice scheduling is still done manually which consumes a lot of time, effort and money". [6]

From the problems described above, it is necessary to have a scheduling system that is able to manage schedules well, fast and easy automation, able to provide information on laboratory availability and easy and inexpensive to implement.

This study aims to provide recommendations and information on the use of open-source software (OSS) e-reservation Meeting Room Booking System (MRBS) that can be used for laboratory scheduling. The selection of OSS itself is in order to support the IGOS (Indonesian, Go Open Source) government program. The IGOS program has the main goal of making open-source software widely accepted and can make it easier for academics to use free software and encourage creativity to develop it [7]. This is in line with the issuance of circular letter No: 05/SE/M.KOMINFO/10/2005 concerning the Use and Utilization of Legal Software in Government Agencies and circular letter No: SE/01/M.PAN/3/2009 concerning Utilization Legal Software And Open Source Software (OSS).

It is expected that the use of MRBS e-Reservation OSS in the preparation of laboratory schedules can accommodate and minimize obstacles arose and worked optimally, effectively and efficiently compared to manual scheduling.

2 Research Method

The method used in this study uses a qualitative where data is obtained from several ways as follows:

2.1. Study Documentation

Documentation is searching for data about variable things in the form of notes, transcripts, books, newspapers, magazines, minutes, meeting agendas, and so on. [8]

2.2. PIECES Analysis Method

The method that uses six variables, namely Performance, Information, Economic, Control, Efficiency, and Service. It is used to identify system weaknesses that produce recommendations for improvement and must be made on the system to be developed. [9]

The reason why we choose the PIECES method in this study because this method can describe how the system's role in helping complete the existing work [10].

3 Literature Review

3.1 Open-Source Software (OSS)

Quoting from opensource.com, Open-Source Software is the one with source code that can be checked, modified, and improved by anyone. Source code is a piece of software that most computer users never see which can be manipulated by computer programmers to change how a software

"program" or "application" works. Programmers who have access to the source code of computer programs can improve the program by adding features to it or fixing parts that don't always work correctly. (<https://opensource.com>)

3.2 Meeting Room Booking System (MRBS)

Meeting Room Booking System is a web calendar platform that has a PHP and MySQL-based GNU General Public License (GPL) for booking rooms and other resources (<https://mrbs.sourceforge.io/>)

3.3 Scheduling

Scheduling serves as a guide for setting time and allocating existing resources to achieve the goals set so that scheduling can be completed on time according to a predetermined plan [11].

3.4 Laboratory Management

According to the Regulation of the Ministry of Empowerment of State Apparatus and Bureaucratic Reform of the Republic of Indonesia Number 7 of 2019, laboratory management includes planning for laboratory activities, operating equipment and materials use; equipment maintenance and materials; laboratory work system evaluation; and laboratory activities development.

3.5 PHP Programming Language

PHP is an acronym for Hypertext Preprocessor, which is a programming language based on codes (scripts) that are used to process data and send it back to a web browser into HTML code [12]. In principle, the server will work if there is a request from the client. In this case the client uses PHP codes to send requests to the server.

3.6 MySQL Database

One of the software that functions as a DBMS (Database Management System) is MySQL. MySQL database is a database software in the form of a relational database or called a Relational Database Management System (RDBMS) which uses a query language called SQL (Structured Query Language). In addition, MySQL can also set database access permissions on registered users so that data is more secure. [13]

3.7 Unified Modeling Language (UML)

The Unified Modeling Language is a modeling language that uses the object orientation concept created by Grady Booch, James Rumbaugh and Ivar Jacobson under the banner of Rational Software Corp. UML provides Symbols that help model systems from multiple perspectives. UML is not only used in software modeling, but in almost all fields that require modeling [14].

4 Result and Discussion

4.1 PIECES System Analysis

The following are the results of system analysis using the PIECES Analysis framework (Performance, Information, Economy, Control, Efficiency, Service) to see a comparison between the old conventional system and the new computer-based system.

Table 1. Comparative Systems Analysis Using PIECES

| Analysis | Manual System | MRBS System |
|-------------|--|---|
| Performance | Making and recording schedules using a book or Ms. Excel. | The process of making schedules and reports is web-based and stored in a database. |
| Information | Laboratory availability information is checked by looking at books/notes, lab use permission must contact the manager | Laboratory availability information can be accessed at any time through the website without the need for permission |
| Economic | There needs to be an allocation of operational costs for the purchase of books/paper and stationery | Paperless and without stationary, the initial costs of building a SIM such as hosting rental, purchasing domains and SSL, then only management. |
| Efficiency | It takes longer time to use the laboratory, starting from availability information, licensing to usage reports. | The availability of the laboratory can be accessed at any time, so as to speed up the scheduling process and usage reports. |
| Service | Conflicting schedules often occur, a long licensing process can hamper the practicum process and laboratory management performance | The system is automated which makes it easier for users to schedule practicums, so it is expected to improve the performance of laboratory management |

4.2 System Proposal

After the results of the PIECES analysis which found problems in the manual scheduling system is known, the next step is to provide recommendations for the right information system which is able to accommodate and minimize existing constraints. The laboratory scheduling system proposed in this research is OSS e-Reservation MRBS. The following is the default design for the OSS e-Reservation MRBS system. This design can be developed by the user according to the needs:

Use Case Diagram. In Figure 4.1 there are two actors and five activities (*use case*).

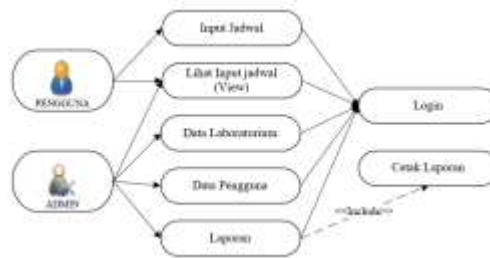


Fig. 1. Architecture of a typical wireless sensor node.

Users can input schedules and view schedule inputs, while admins can add laboratory data, add user data and reports, all of which are included in one use case called the login use case. Here is the use case table:

Table 2. Description of MRBS Use Case Diagram

| Use Case | Actor | Description |
|---------------------|----------------|--|
| Schedule Input | User | Users can schedule by selecting the time and laboratory to be used. |
| View Schedule Input | User and Admin | Users and admins can view, correct or delete the schedule that has been created. |
| Laboratory Data | Admin | Admin can add, view, modify and delete laboratory data. |
| User's Data | Admin | Admin can add, view, modify and delete user data. |
| Report | Admin | Admin can make reports |

Class Diagram. At this stage the class diagram is used to describe the structure that describes the relationships or relationships between entities in the database contained in the system. The following is a description of the relationship between entities.



Fig. 2. MRBS Use Case Diagrams.

4.3 User Interface

The following is the structure of the MRBS e-Reservation OSS display:

Main Page. This page is the initial view of the MRBS e-Reservation OSS. This page provides information on laboratory availability and time that can be used by users.

Fig. 3. MRBS Homepage.



Scheduling Input Form. On this page the user makes a schedule according to the laboratory and the desired time.



Fig. 4. Scheduling Input Page.

View Scheduling Input Form. On this page the user can view and update the schedule that has been created.



Fig. 5. Page View Scheduling Input.

Add Laboratory Data Form. It is a page managed by an admin. Admin can add (create), view (read), fix (update), and delete laboratory data.



Fig. 6. Add laboratory data page.

Report Form (Admin). On this page the admin can make reports according to their needs. Reports can be made by laboratory or by date.



Fig. 7. Report page.

5 CONCLUSION

The preparation of a laboratory schedule carried out manually has several obstacles, therefore with the OSS e-Reservation it is expected to support more effective and efficient laboratory management by utilizing information technology, especially Open-Source Software (OSS). For further research, it is necessary to develop e-Reservation OSS on mobile devices based on Android, IOS or Windows Phone.

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