

Web-base Inventory Control System for Practice Materials Using Waterfall Model

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Abstract. Practicum courses require practice materials in their implementation. The Department of Tourism at the Politeknik Negeri Media Kreatif has many practicum courses where each practicum subject requires different practical materials must be managed. However, management of practice materials is still done manually by entering data into Microsoft Excel one by one. So, data errors often occur, such as unrecorded practice material data, lost data, or double-recorded data. To overcome these problems, we need a material inventory system that is easy to run and integrated between users so that it will produce real-time reports. Thus, the outcome of this research was a web-based material inventory control system using a waterfall model. The implementation of the programming language uses the PHP CodeIgniter framework. The database design uses Mysql and UML as model design. The prospect of the system can be applied to the tourism department and other departments that also manage supplies of practice materials.

Keywords: information system, practice material, inventory

1 Introduction

Inventory has a necessary function for the company because inventory will helps smooth the production process in a company [1]. Dynamic changes in demand, varied inventory types, and the use of high levels of inventory are common challenging issues in inventory systems. Therefore, Inventory control needs to be carried out properly so that activities related to logistics can run smoothly [2]. Under the Indonesian government's provisions, vocational colleges' curricula must have a ratio of 60% in the form of practical courses and 40% in the form of theoretical courses [3]. This means many practical courses will require a large number of practice materials and various types of practice materials according to the needs of each practicum.

The Department of Tourism is one of the majors at the Creative Media State Polytechnic that needs a massive supply of practice materials and diverse types of practice materials. Inventory management in the Department of Tourism becomes a challenging problem because inventory administration activities are only written by hand and then inputted into Microsoft excel. Thus, Problems that often arise include loss of record data (incoming and outgoing goods transaction books), difficulty checking the stock of practice materials for each course, discrepancies between the number of items, and reporting data given to the leadership of Study

Programs and Departments. In this paper, we develop a web-based inventory control information system to overcome data problems that still use the manual method [4].

2 Research Methods

There are many categories related to the types of software engineering (SE) practices and techniques. Therefore, it is important to know the various types of software engineering (SE) used in the industry. Two software development models that need to be known are the waterfall and the agile model. Of the two models, the waterfall model is the most popular application development model [8]. The development of this information system uses the System Development Life Cycle (SDLC) model with the waterfall method. which consists of five stages [9]. The first stage is to analyze and identify user needs, system development needs, and the scope of system development. The second stage focuses on data structure design activities, system design, and business processes. The next stage is the programmer will translate the design results into a particular programming language. In the fourth stage, logical and functional testing of the software will be carried out using the black box testing method. Testing will focus on the external appearance and functions of the application interface menu to see if everything can run as it should and if there are no more program errors. Finally, the last stage is the user will operate the system that is ready to use, and the system needs to be maintained by the developer. The maintenance function is to fix undetected errors. In addition, developers also can make system changes, such as adding functions, reducing system functions, or modifying system functions or application menus.[6]

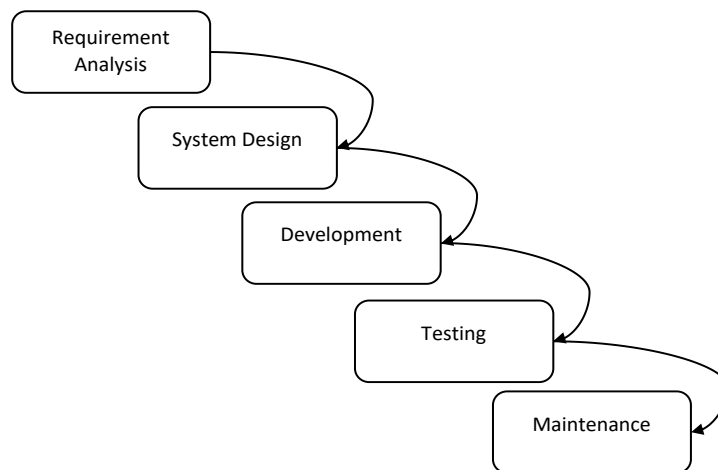


Fig. 1. Waterfall Model

The implementation of the programming language uses the PHP (Hypertext Preprocessor) CodeIgniter framework. CodeIgniter claims to be a PHP framework they have the fastest processing compared to other frameworks. The database design uses Mysql (My Structured Query Language). Mysql is an open source program that is easy to use. [7] UML (Unified Modelling Language) as a tool to design an overall inventory information system.

3 Result and Discussion

3.1 Use Case Diagram

Use case diagrams are made to show the interaction between system users and the system used. The actor created in the use case diagram serves to describe something that is outside the system and interacts with the system that is running. Actors involved in this system consist of lecturers, warehouse admins, and management. These three actors have different access rights in the system. The activities carried out by the lecturers include managing material submissions, material usage forms, and managing login processes. Then, the activities carried out by the admin staff include checking material submission, checking material usage, managing login processes, and managing stock. Finally, the activities carried out by management are managing login processes, managing stock, print material submission reports, print material usage reports, printing material stock reports, and managing user accounts. The Use case diagrams of the three users can be seen in Figure 2.

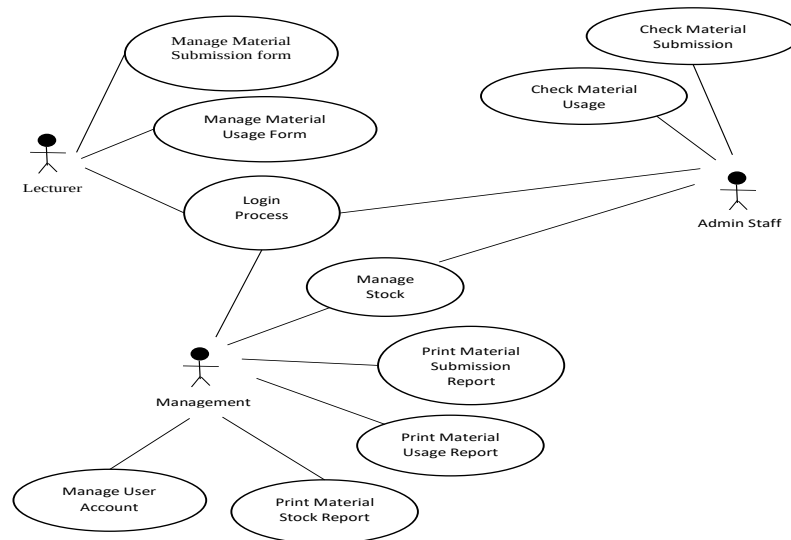


Fig. 2. Use Case Diagram

3.2 Activity Diagram

In this material inventory information system, the sequence of activities in the process is grouped based on the system user actors, namely lecturers, warehouse admins, and management. These activity diagrams will also describe the actions that need to be carried out by the actor and when the action must occur.

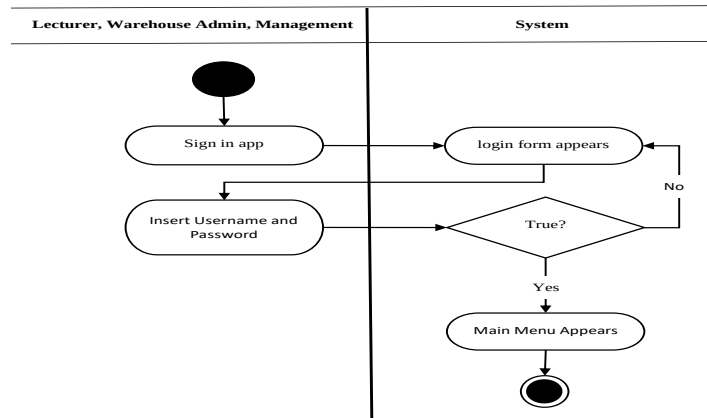


Fig. 3. Activity Diagram Login

The activity diagram in figure 3 explains the information flowchart to 3 actors (lecturer, warehouse admin, and management) to login into the system. Activity start when the actors sign in to the app then the login form appears from the system. Further, the actors input the username and password, and the system will verify the username and password match the database. If username and password match then the actors can login into the system and main menu appears. On other hand, if username and password doesn't match the actors will back to the login form appears.

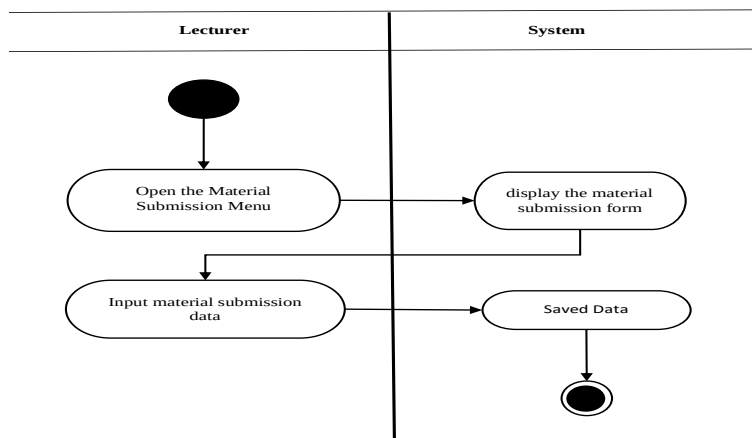


Fig. 4. Activity Diagram Material Submission Form for Lecturer

Activity Diagram Material Submission Form for Lecturer start by activity to open the material submission menu. The system will display the material submission form according to the materials needed by every lecturer. After that, the lecturer can input material submission data. The last activity is the system will save the data. This Activity diagram is shown in figure 4.

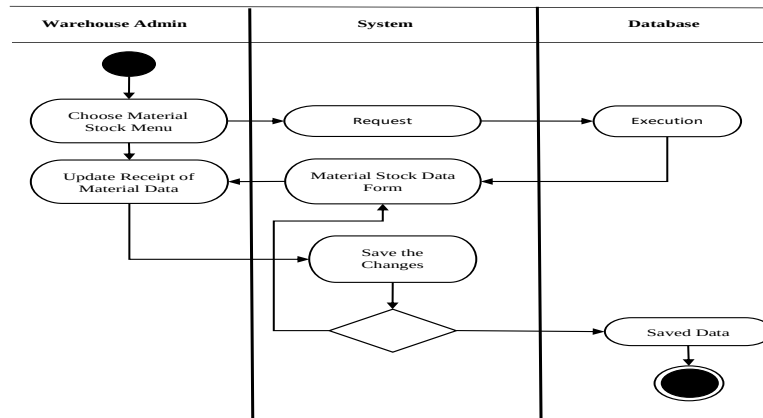


Fig. 5. Activity Diagram Manage Stock for Warehouse Admin

Activity Diagram Manage Stock for Warehouse Admin starts with admin staff choosing the material stock menu. After selecting the stock menu, the system will request the execution to the database. Then the system will display the material stock data form. Next, the admin staff can update the material stock data form. The system will store material stock data changes made by the admin staff. Figure 5 shows the stock management activity diagram.

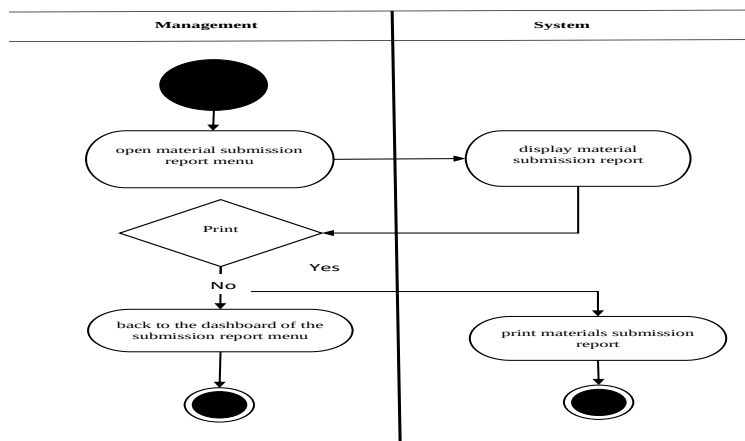


Fig. 6. Activity Diagram Material Submission Report for Management

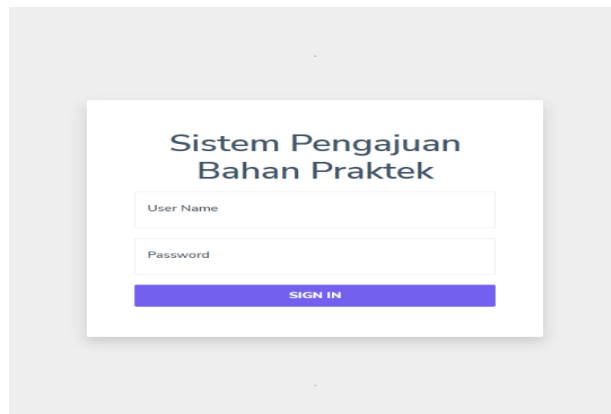
Figure 6 describes the activity diagram for submitting practice material reports for management. The activity starts from the management open material submission report menu. After that, the system will proceed to display the material submission report. Next, management has the option of whether they print it or not. If management chooses to print it out, then the system will print the materials submission report. Otherwise, the system will return to the dashboard of the submission report menu if the management chooses not to print it out.

3.3 User Interface

System implementation is the last stage of developing an application system that is ready to be implemented in visible conditions. The following displays the results of the implementation of the system:

a. Login Menu

This view will appear when the user wants to enter the software. Each user has a different username and password for access to the software. The login menu display is shown in the figure 6.

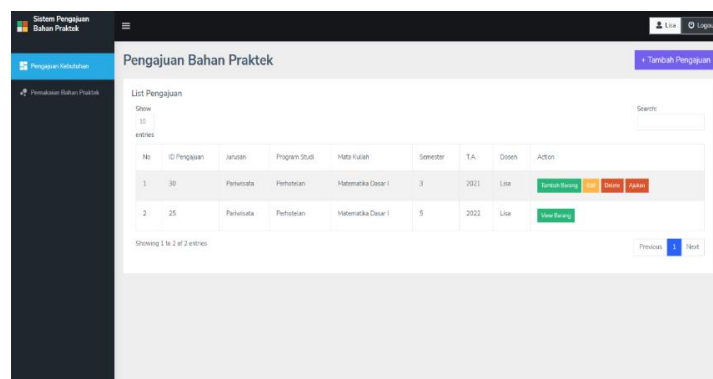


The login menu display is a white rectangular box centered on a light gray background. It features the title "Sistem Pengajuan Bahan Praktek" in a bold, dark blue font. Below the title are two input fields: "User Name" and "Password", both with light gray borders. At the bottom of the box is a prominent purple button with the text "SIGN IN" in white, uppercase letters.

Fig. 6. Login Menu Display

b. Material Submission Form Menu for Lecturer Display

This page serves to submit practice materials needed by lecturers during practicum courses. The lecturer must first enter basic information from the practicum course. After that, the lecturer can enter data on the need for practice materials by pressing the add submission button.



The screenshot shows a web application interface for "Sistem Pengajuan Bahan Praktek". The main content area is titled "Pengajuan Bahan Praktek" and includes a "+ Tambah Pengajuan" button. Below this is a "List Pengajuan" section with a search bar and a table of submissions. The table has columns for No, ID Pengajuan, Jurusan, Program Studi, Mata Kuliah, Semester, T.A., Dosen, and Action. Two entries are visible: one for "Penerbitan" and one for "Perbaikan". The Action column contains buttons for "Batal", "Kembali", and "Hapus".

No	ID Pengajuan	Jurusan	Program Studi	Mata Kuliah	Semester	T.A.	Dosen	Action
1	30	Penerbitan	Perbaikan	Matematika Dasar I	3	2021	Lisa	<button>Batal</button> <button>Kembali</button> <button>Hapus</button>
2	25	Perbaikan	Perbaikan	Matematika Dasar I	5	2022	Lisa	<button>Kembali</button>

Fig. 7. Material Submission Form Menu for Lecturer Display

c. Manage Stock for Warehouse Admin Menu Display

This page functions as the management of material stock in the warehouse. Users who can carry out this function are admin staff and management. On this page, users can enter and sort

expiration data for each practice material that enters the warehouse by pressing the edit button. Users can also view the details of each ingredient by clicking the details button. In addition, users can delete practice materials that are no longer available in the warehouse. Finally, users can add practice material that the lecturer missed by pressing the add stock button. Figure 8 shows the display of the managed stock menu.

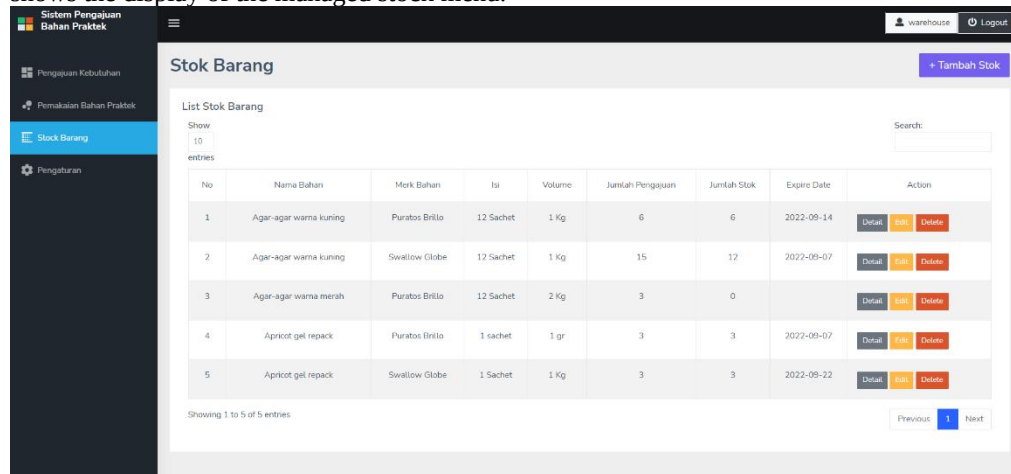


Fig. 8. Manage Stock for Admin Staff Menu Display

d. Material Submission Report Menu for Management

This page serves as a menu for printing reports on practice material submissions. Only management can perform this function. Furthermore, users can print statements on all practice material submission data. To be able to print a report, the user must press the print process button.

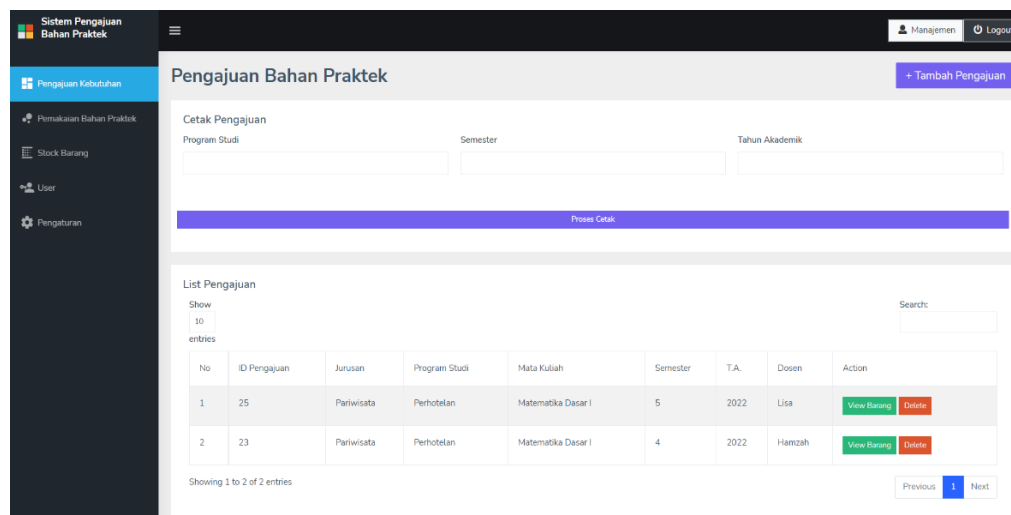


Fig. 9. Material Submission Report Menu for Management

2.3 Functional Testing (Blackbox) for System Inventory of Practice Materials

Testing the functional requirements of the practical material inventory system in this research uses black box testing (black box testing). Black box testing is a software testing method to test the application functionality [5]. Specific knowledge of application code/internal structure and programming knowledge is generally not required in black-box testing. Blackbox testing used in this study uses a requirement test concerning activities to ensure that the program unit meets the requirements stated in the specification. In other words, this testing observes the execution results based on the test case scenario. These tests have been carried out by 10 users with roles as Management, Lecturer, and Warehouse Admin.

Table 1. Blackbox Testing for System Inventory of Practice Materials

No	Test Description	Test Result	description
1	Login user Management, Lecturer, and Warehouse Admin	The system will display the main menu	Valid
2	Pressing the menu (on click)	The system opens the selected menu	Valid
3	Save with all the fields already filled	The system will display a "success" notification	Valid
4	Add, remove and edit products	The system will display a "wipe data successful" notification	Valid
5	Print reports on submission of materials, use of materials, and availability of practice materials	The system will display Report and print with the option to save the pdf version	Valid
6	Add user	The system will display a notification "added user successfully".	Valid
7	Logout menu	Logout	Valid

2.4 Beta Testing Results of Practice Material Inventory Information System

From the results of interviews with Management users, Lecturers, and Students who carried out functional testing, it was found that:

1. The system is very useful for knowing the amount and type of material that will be needed according to each course.
2. The existence of material expiration list data is useful for prioritizing materials that will expire for use, thus avoiding materials that are wasted due to expiration.
3. The system can make it easier for the Warehouse admin to find out the amount and type of availability of goods.

While the input obtained from functional testing is as follows:

1. It is necessary to add a special notification of goods that will expire within 2 months before the deadline.
2. The system is named so that it is easy to remember.
3. The download feature is provided in excel, word, and pdf formats.

4 Conclusions

This study develops a web-based inventory control information system using five standard stages of the waterfall method (analysis, design, implementation, testing, and support). The actors involved in this information system consist of three actors, namely lecturers, warehouse admins, and management. Based on the results of the beta test, it can be concluded that the user feels very helpful in making data collection and reporting of practice materials. In addition, the availability of material expiration date data helps users determine which practice materials must be issued first

Acknowledgments

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