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# Design of a Web-Based Library Information System Using the Rapid Application Development Method at SMKN 3 Medan

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**Abstract**
Library is a collection of books and magazines. Library can be used as a system that can be designed using the Rapid Application Development method where the method has 3 stages, namely planning requirements, design workshops, and implementation. And using php as a css library. In addition, the library information system also uses a framework as a framework so that the programming structure is neat, both in terms of code and php file structure. Using the phpmyadmin database to store information data in the library information system.

***Keywords***: *Library, Bootstrap, Rapid Application Development (RAD)*

## 1. Introduction

A library serves as a vital center for information and learning in education, allowing students and teachers to access various books and references to support teaching and learning activities [1]. Therefore, a well-structured management system and adequate facilities are needed to improve library services. Manual library management often encounters problems such as difficulties in searching for books, managing member data, and recording borrowings and returns [2]. The Rapid Application Development (RAD) method, which includes three phases—requirement planning, design workshop, and implementation offers a blueprint as a reference for designing a web-based library system tailored to the library's needs. SMK Negeri 3 Medan already has a library as a learning support facility. However, with the growing number of students and book collections, manual management becomes increasingly ineffective. Manual recording of borrowings and returns is prone to data loss, inaccurate entries, and difficulty in real-time monitoring of book availability, while manual book searches slow down service times [3]. To overcome these issues, SMK Negeri 3 Medan requires a computerized library information system to improve the efficiency of book data management, borrowing, and returning, while also providing easier online access for users. This system is expected to minimize existing problems and optimize the library's role in supporting the school's learning process [4]. The RAD method, which focuses on speed and flexibility, is used in designing the web-based library information system at SMKN 3 Medan. Its rapid development process enables fast system creation through prototyping and quick iteration, with direct user feedback from library staff to ensure the system meets their needs. The flexibility of RAD allows design changes without restarting the entire process, and gradual testing reduces the risk of major errors. Based on this background, the researcher is interested in conducting a study titled: "Design of a Web-Based Library Information System Using the Rapid Application Development Method at SMKN 3 Medan."

## 2. Research methods

### 2.1. Problem Analysis

The library at SMKN 3 Medan is an essential unit in supporting teaching and learning activities. However, the current manual management system leads to various issues that affect the effectiveness of services and students' reading interest. Problems identified at SMKN 3 Medan include:

1. Manual System Book borrowing and return data are managed manually, resulting in recording errors and difficulties in tracking books.
2. Limited Access to Information Students face difficulties in finding information about available book collections due to the lack of an integrat ed system for accessing such data.

3. Low Library Visits Student interest in visiting the library is low due to the lack of engaging facilities and services.
4. Lack of Technology Use There is no web-based information system to simplify the borrowing and returning process as well as the overall library data management.

## 2.2. System Requirements Analysis

The current system in the library of SMKN 3 Medan begins when teachers or students visit the library and fill out a visitor log, which is recorded by the librarian, including details such as name, position, class, purpose of visit, and signature. When a teacher or student wants to borrow or return a book, they are required to manually fill in the borrowing and returning information in the logbook. After that, the librarian processes the book borrowing or return manually.

## 2.3. Web-Based Library System

The proposed system is the development of a web-based library application that enables digital data management. This system will include several key features:

1. Member Registration Students can register as library members online.
2. Digital Book Catalog Provides access to an integrated book catalog, allowing students to easily search and check book availability.
3. Book Borrowing and Returning Automated book borrowing and returning features, including return reminders to reduce late returns.

## 2.4. System Benefits

The implementation of a web-based library system is expected to provide several benefits, including:

1. Time Efficiency Reduces the time needed to search for books and process borrowings.
2. Reduced Paper Usage Minimizes paper usage in transaction recording, aligning with environmental sustainability efforts.
3. Improved Information Access Students can access information about books anytime and anywhere.

## 2.5. Analysis of the proposed system

To carry out the proposed system modeling process, it will be Use case diagrams are used as a tool.

1. Use case diagram

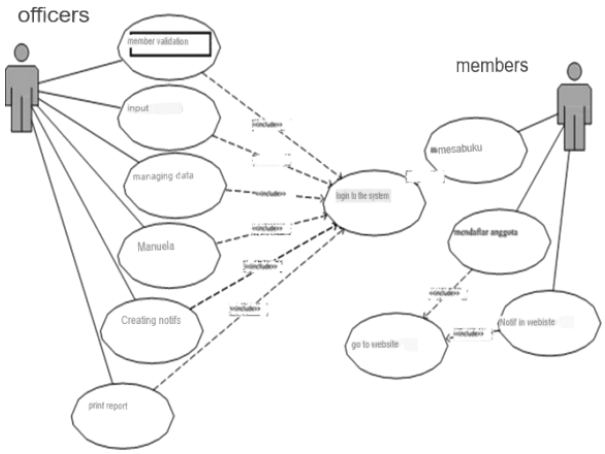


**Fig. 1:** Use Case Diagram

2. Sequence diagram

Sequence diagram of member registration for first time registering to borrow books in the library.

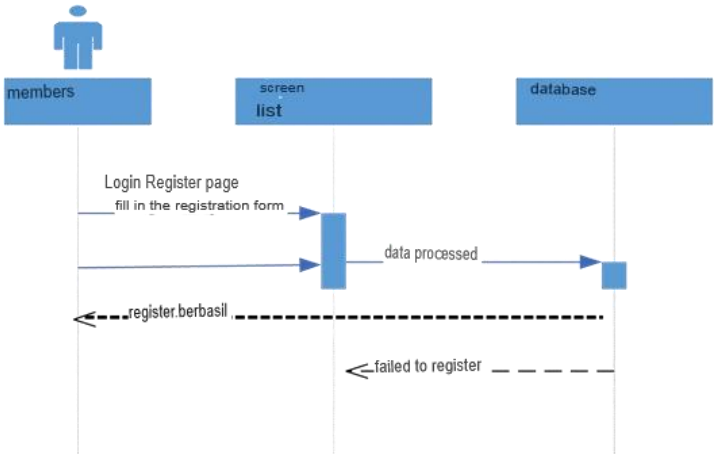


**Fig. 2:** Sequence diagram

Students who have registered require validation from the library staff, therefore the staff must log in first and enter the member page to validate the member account that will be activated.

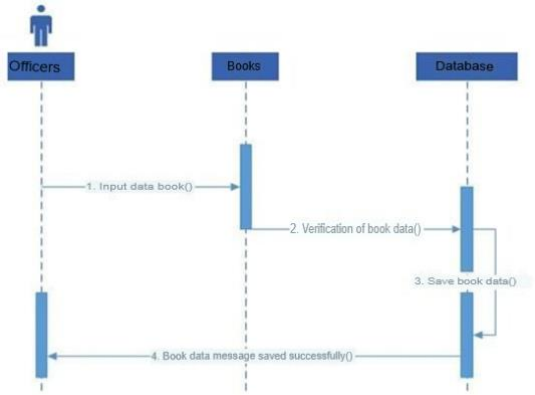


**Fig. 3:** Student validation sequence diagram

Once a member has entered the required information for the book order, a message will appear stating that the book has been placed. Once the order has been successfully placed, the member must then visit the library to validate the loan.

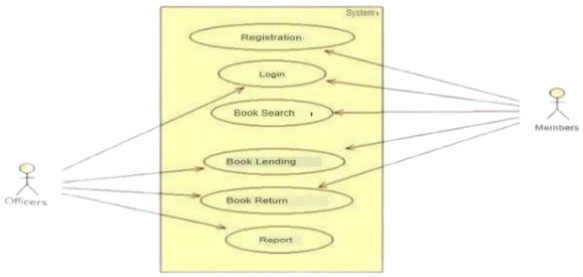


**Fig. 4:** Sequence diagram of book ordering

To register, prospective members can open the website and then fill out the form according to the prospective member's personal data. The following is an activity diagram for registering prospective library members.

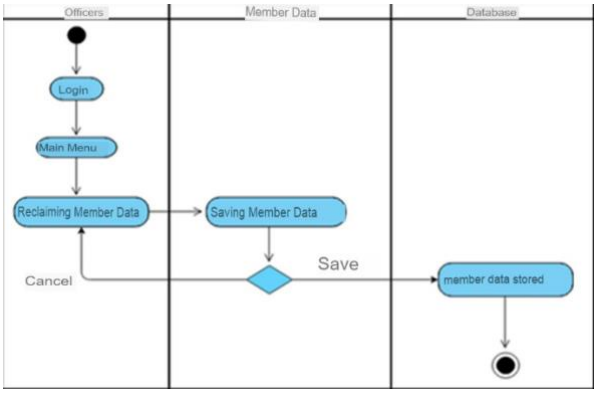


**Fig. 5:** Activity Diagram Pendaftaran Anggota

In the process of returning a book, members must come to the library and hand over the book and library membership card to the officer, then the officer will immediately process the return of the book.

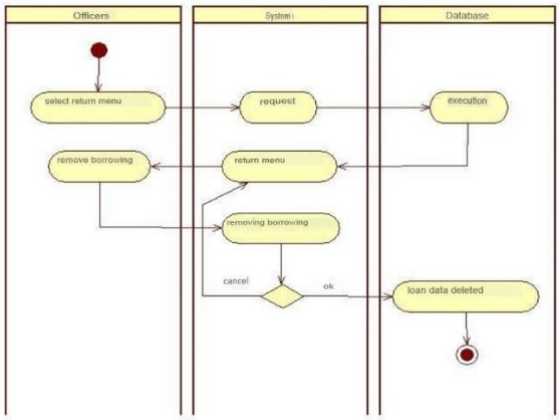


**Fig. 6:** Return Activity Diagram

## 3. Result and discussion

### 3.1. Website display result

The library information system designed aims to assist library data management at SMKN 3 Medan, from borrowing and returning to reporting. This web-based system can be accessed via a local network or the internet. The design was carried out using the Rapid Application Development (RAD) method, which consists of several main stages: Requirements Planning, User Design, Construction, and Cutover.

a. login page display

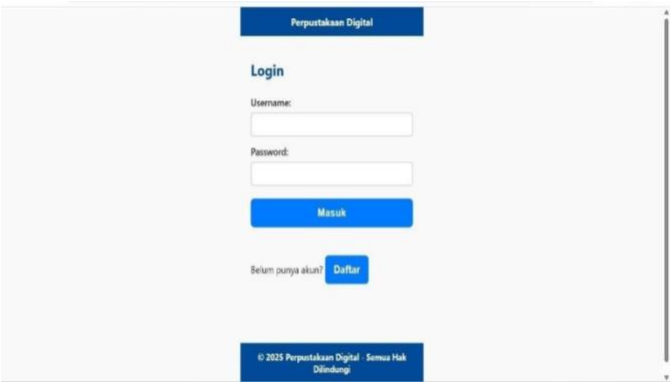


**Fig. 7:** Results of the login page display

b. Book Catalog Page


**Fig. 8:** Results of Book catalog page

c. Book Return Page

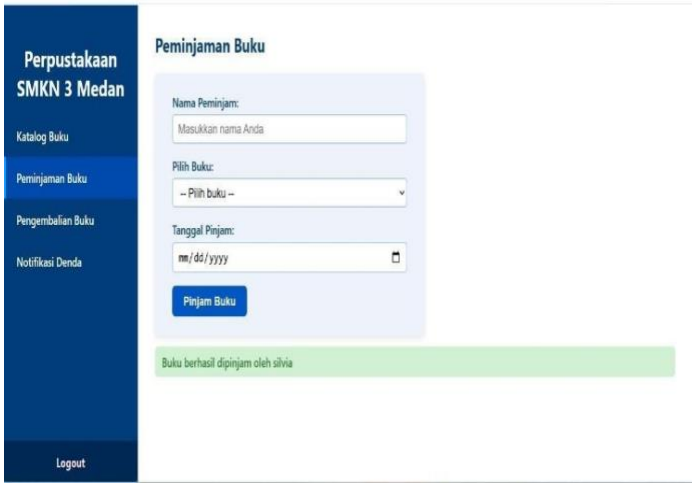


**Fig. 9:** Display of Book Return Page

d. Student Data Page

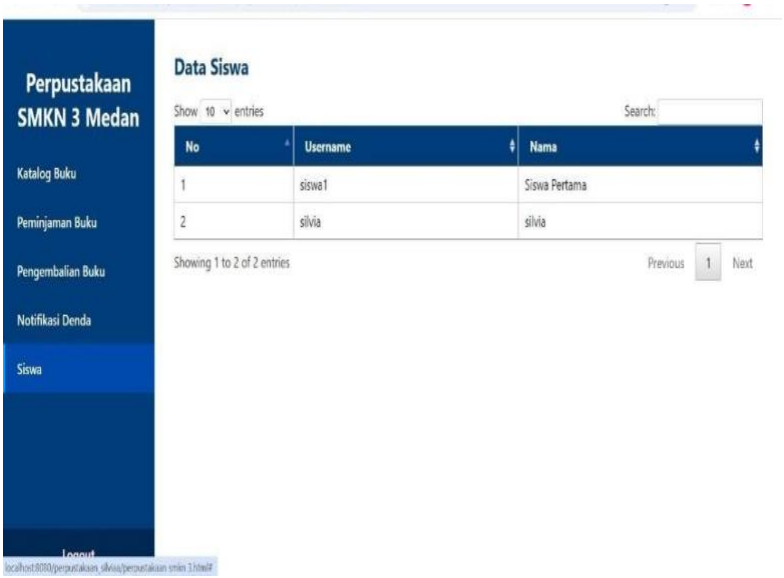


**Fig. 10:** Student Data Page

## 4. Conclusion

Based on the design and implementation of a web-based library information system at SMKN 3 Medan, the following conclusions can be drawn:

1. The designed library information system has been able to assist library staff in managing book, member, borrowing, and return data better than the previous manual system.
2. The application of the Rapid Application Development (RAD) method in system development has proven to provide rapid and tailored results, as it directly involves users in the design and evaluation process.
3. The web-based system provides access while connected to the network and facilitates data retrieval and report generation.
4. The results of system testing and evaluation indicate that the system is suitable for use and meets the basic needs of library management at SMKN 3 Medan, although there are still some shortcomings that can be improved in the future.

## 5. Suggestions

The following suggestions can be made for the future development and utilization of this system:

1. Training is needed for library staff, particularly in system usage, to ensure smooth operations.
2. Developing an automatic notification feature (e.g., email) to remind members of book return due dates is highly recommended for optimal service.
3. The system should be developed for multi-user use, so that students can also access the system to view their book collection and borrowing history independently.
4. Regular data backups should be performed to prevent data loss due to system disruptions or hardware failure.

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