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Research Article

Application of the Rapid Application Development Model to a Web-Based Library Information System

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Abstract
This study aims to overcome several problems in library management at SMA Negeri 7 Tambun Selatan by designing and developing a web-based library information system using the Rapid Application Development (RAD) method. The background of the problem includes the use of information technology, which is still limited in the library, so the process of recording, borrowing, and returning books is still done manually and takes a long time. In addition, the lack of an effective book search system is also an obstacle to using library collections. This research identifies these problems and formulates aims and objectives to create the right solution. In order to achieve this goal, the research method used involved data collection techniques, such as direct observation in the library, interviews with librarians, and a literature study to obtain relevant information. The result of this research is a web-based library information system that includes managing data on borrowing and returning books, book data, book category data, fines data, and making library data reports. This system allows librarians to record borrowing and returning books more efficiently, as well as facilitate students and staff in finding the desired book quickly and accurately through the search feature provided.

Keywords: School Libraries, Web-Based Information Systems, Rapid Application Development

Abstract
Penelitian ini bertujuan untuk mengatasi beberapa permasalahan dalam pengelolaan perpustakaan SMA Negeri 7 Tambun Selatan dengan merancang dan mengembangkan sistem informasi perpustakaan berbasis web menggunakan metode Rapid Application Development (RAD). Latar belakang permasalahan meliputi pemanfaatan teknologi informasi yang masih terbatas di perpustakaan tersebut, sehingga proses pencatatan peminjaman dan pengembalian buku masih dilakukan secara manual dan memakan waktu yang lama. Selain itu, kurangnya sistem pencarian buku yang efektif juga menjadi salah satu kendala dalam memanfaatkan koleksi perpustakaan. Penelitian ini mengidentifikasi permasalahan tersebut dan merumuskan maksud serta tujuan untuk menciptakan solusi yang tepat. Dalam rangka mencapai tujuan tersebut, metode penelitian yang digunakan melibatkan teknik pengumpulan data, seperti observasi langsung di perpustakaan, wawancara dengan petugas perpustakaan, dan studi pustaka untuk mendapatkan informasi yang relevan. Hasil dari penelitian ini adalah sebuah sistem informasi perpustakaan berbasis web yang meliputi pengelolaan data peminjaman dan pengembalian buku, data buku, data kategori buku, data denda, serta pembuatan laporan data perpustakaan. Sistem ini memungkinkan petugas perpustakaan untuk melakukan pencatatan peminjaman dan pengembalian buku dengan lebih efisien, serta memfasilitasi siswa dan petugas dalam mencari buku yang diinginkan dengan cepat dan akurat melalui fitur pencarian yang disediakan.

Kata Kunci: Perpustakaan Sekolah, Sistem Informasi Berbasis Web, Rapid Application Development

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1. Introduction

Technological advances are very rapid, making it easier for humans to search for information. Information technology is a technology that uses computers and telecommunications tools to produce comprehensive and quality information, including information sources, storage media, reception, search, and use of information (Suprapto 2018). The benefits of information technology can be felt in running businesses in various sectors, including in the education sector. There are lots of jobs in schools that utilize information technology.

A school library is a place that students use to look for sources of information, one of which is books; this place is very helpful in supporting the teaching and learning process at school so that it can improve quality education (Sianturi and Hendriani 2021). In order for this goal to be achieved, adequate facilities and infrastructure are needed to improve the quality of services in libraries. The quality of the services provided is a measure of success in this process. If library service standards meet user expectations, users will feel satisfied. However, on the other hand, if library service standards do not meet user expectations, users will feel dissatisfied. Using the Website and Making it Easy for Officers to Record loan transactions and return books (Putra, Junaidi, A., Handayani, P., & Yunita, 2019).

SMA Negeri 7 Tambun Selatan still applies manual methods in the process of managing library data, including the process of recording borrowing and returning books, recording the number of book collections, as well as searching for the desired information or books, which takes quite a long time and has the potential for human error, so the data is inaccurate. Therefore, the efficiency of library data reporting can be disrupted with the existence of a web-based library program that can provide information needs while overcoming obstacles related to library management.

2. Literature Review

2.1. Information Systems

An information system is a system owned by a company that can be used to support the operation of managerial company activities, such as managing daily transactions to creating reports required by the company (Hutahaean 2016).

2.2. Library

A library is a place that has ready access to a collection of reading sources and other information that is arranged regularly. Libraries usually have various types of reading materials, such as novels, magazines, journals, books, newspapers, audio recordings, videos, and other digital information sources (Anwar, Maskur, and Jailani 2019).

2.3. Rapid Application Development

RAD (Rapid Application Development) is a software development method that uses a development life cycle that occurs quickly and briefly and is classified as an incremental technique (Nugroho, 2017).

2.4. UML

Unified Modeling Language UML is a tool that helps to analyze business, design, and develop software that aims to explain or describe the business processes, structures, and behavior that run in the software (Masripah et al. 2019).

2.5. ERD

Entity Relationship Diagrams(ERD) is a diagram model that describes interactions between data by showing the relationships between data objects in a database (Oktapiani and Kusnadi 2021).

2.6. LRS (Logical Record Structure)

Logical Record Structure(LRS) is the result of a description of the tables and their record forms in a database design using an ER diagram (Andriani and Purnama 2019).

2.7. Website

A website is a series of electronically connected web pages that contain information, images, text, video, audio, and other interactive elements that can be accessed by users via a web browser using a URL (Uniform Resource Locator) (Widia and Asriningtias 2021).

2.8. PHP

Hypertext Preprocessor (PHP) is an open-source programming language in the form of scripts that are stored and processed on a server. The results are sent to every place the user uses the browser. This language is more often used in web applications (Sitepu 2018).

3. Methods

The Rapid Application Development (RAD) model is the method used in developing the system, which is the focus of this thesis. According to (Sagala, 2018), RAD is a system development framework that consists of several levels with short, fast, and short time cycles. This method uses 3 stages of the system development cycle (Putri and Effendi, 2018), including:

1. System Requirements Planning Phase (Requirements Planning)
As a first step in creating a software program, the author identified problems and analyzed system requirements by looking for information about library services that occur at SMA Negeri 7 Tambun Selatan. From this data, the author can implement it to create a library program. This program functions to manage information related to libraries, such as data on borrowing and returning books, book data, book category data, library staff data, student data, fine data, and library data reports.

2. System Design Phase (Design Workshop)
In the second step, after the system requirements planning phase, the author designs a description of the system that occurs in the actual software in order to solve the problems that have been identified. In this step, the author designs a database using MYSQL in the form of an Entity Relationship Diagram (ERD), Logical Record Structure (LRS), and file specifications and designs software using Visual Studio Code. Meanwhile, designing Unified Modeling Language (UML) using use case diagrams, activity diagrams, class diagrams, sequence diagrams, component diagrams, and deployment diagrams.

3. Implementation Phase
The third step after designing the system design, the author will implement it in a software program using the Hypertext Preprocessor (PHP), Hypertext Markup Language (HTML), and Cascading Style Sheet (CSS) programming languages. The author will also display the user interface of the library information system at SMA Negeri 7 Tambun Selatan. Before this program is implemented, a program test will be carried out first with the aim of reducing the occurrence of errors in the input process and finding out whether this program can be used properly or not.

4. Results

3.1. Business Modelling

In this section, there is a planning or analysis of the system requirements that are being created. Business Modeling is at the system requirements planning stage or phase in the Rapid Application Development (RAD) method. The Tambun Selatan 7 Public High School Library system has 2 users, namely Teachers-Librarians (Employees) and Students.

The analysis of the needs of this system is as follows:
1. Functional needs of employees or teacher-librarians
a. Employees can log in to the system.
b. Employees can see the dashboard page.
c. Employees can control user profile data.
d. Employees can control employee data.
e. Employees can control student data.
f. Employees can control class data.

g. Employees can control book category data.
h. Employees can control book data
i. Employees can place orders to borrow books.
j. Employees can control data on borrowing and returning books.
k. Employees can create book stock report data.
l. Employees can create book loan report data.
m. Employees can create book return report data.
n. Employees can log out of the system.

2. Student Functional Needs
a. Students can log in to the system.
b. Students can control user profile data.
c. Students can view the book catalog.
d. Students can order to borrow books.
e. Students can see the history of borrowing books. f. Students can log out of the system.

3.2. Data Modelling
3.2.1. ERD (Entity Relationship Diagram)
Entity Relationship Diagram (ERD) is a conceptual representation used to show the relationship between storage objects in the form of graphic symbols (Oktapiani and Kusnadi 2021).

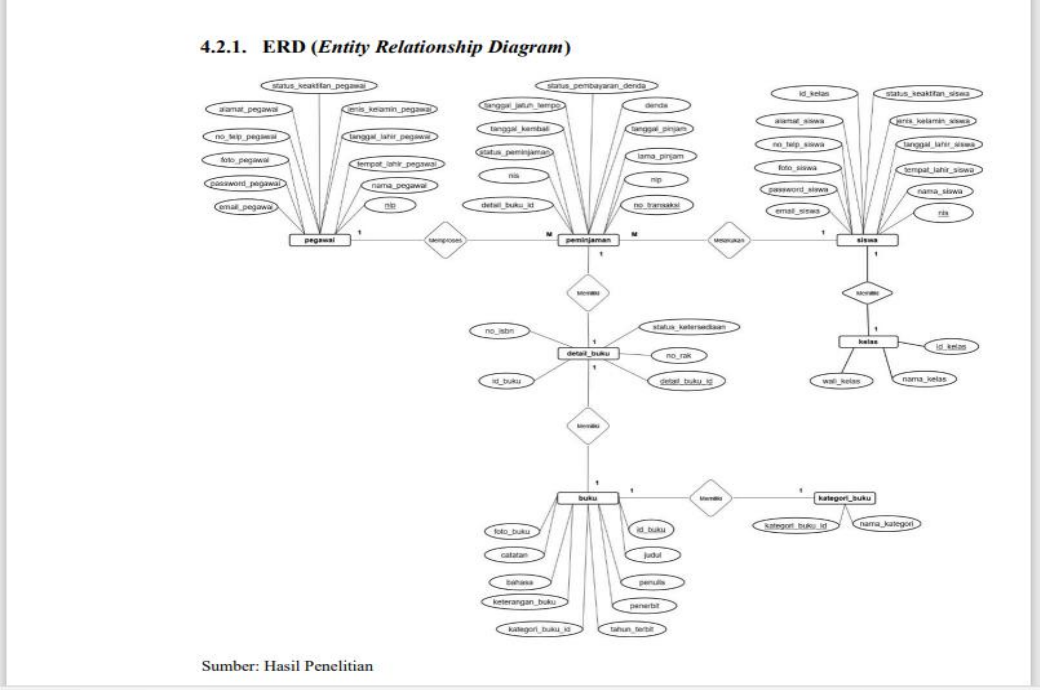


Figure 1. Entity Relationship Diagram (ERD)

3.3. Data Modelling
3.3.1. Usecase Diagrams
A use case diagram is a description of the functionality involved in designing a proposed system, including the functionality of the parties who use the system as users of the system (Ambarita 2020).

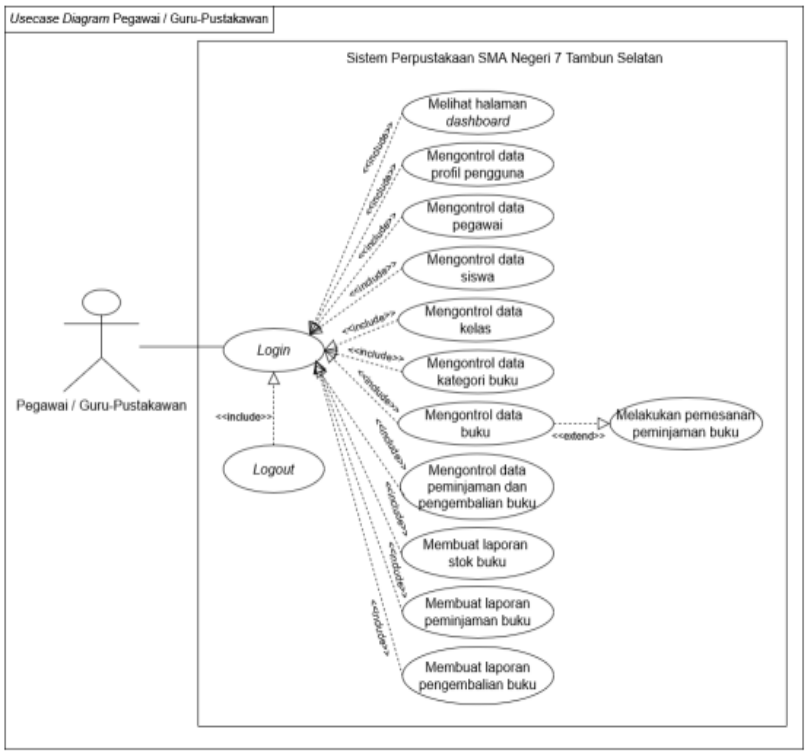


Figure 2. Librarian Usecase Diagram

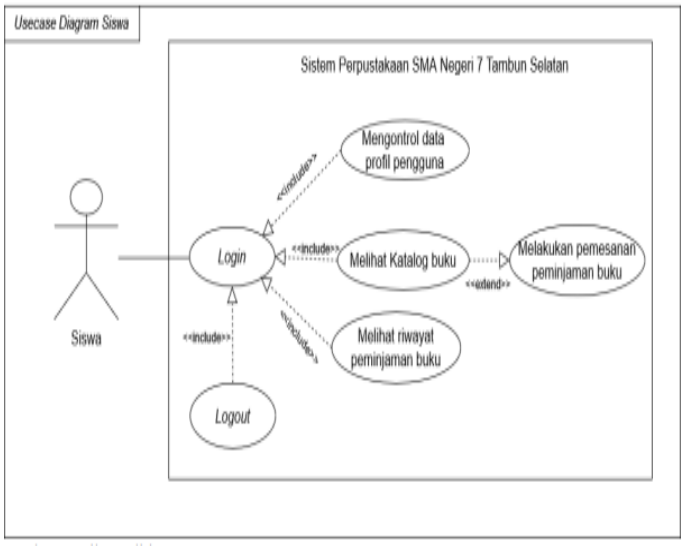


Figure 3. Student use case diagram Librarian

3.3.2. Activity Diagrams

An activity diagram is a description of the flow of activities that occur in a system that is being planned or a job description of use case components that have been previously designed in the system (Ambarita 2020).

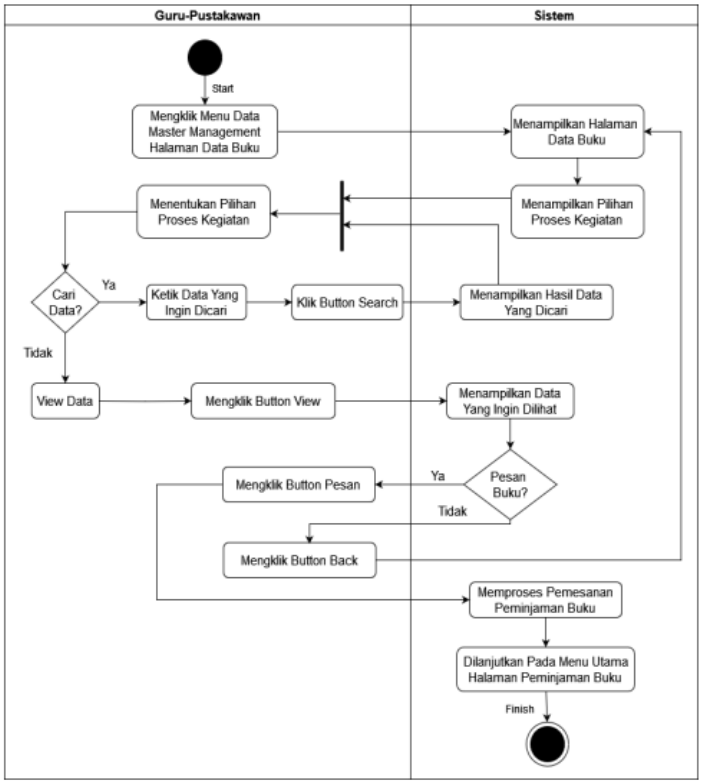
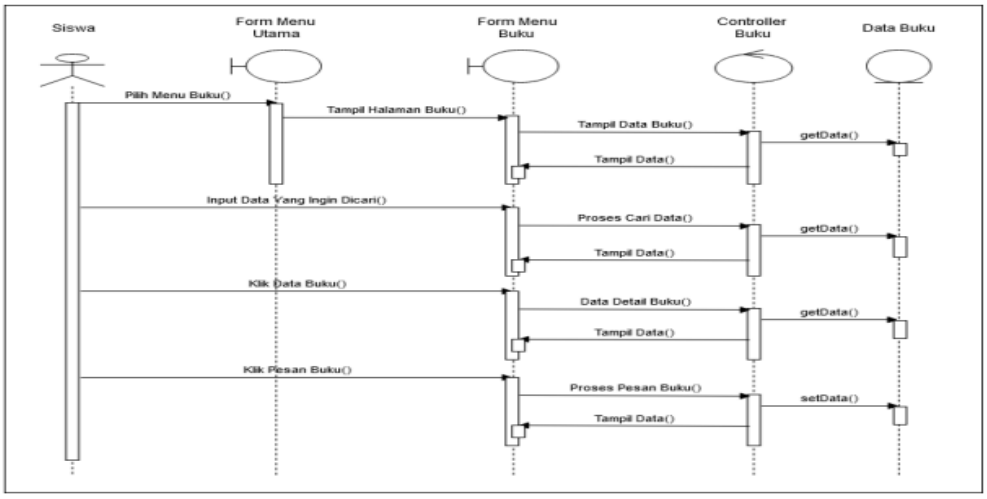


Figure 4. Activity Diagram of Teacher-Librarian Placing Book Borrowing Orders

4.3.4. Sequence Diagrams

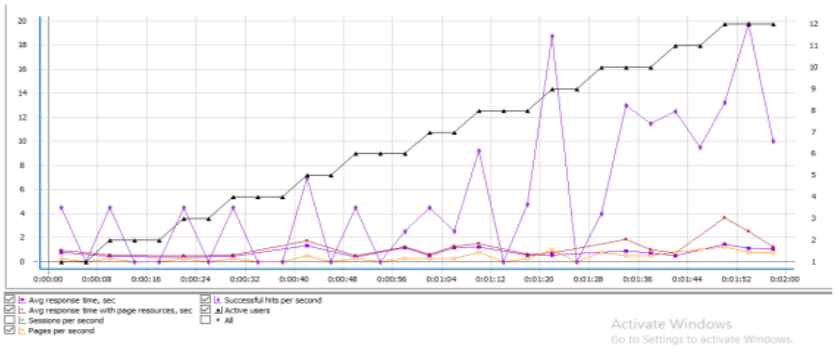


4.5. Testing and Turnover

Testing and Turnover is at the implementation stage or phase in the Rapid Application Development (RAD) method. In this phase, the author carried out system testing on reference materials for creating a library system.

4.5.1. Performance Testing

In this case, performance testing was carried out using the WAPT application to evaluate the extent of the efficiency of technology in the library information system.



From the illustration above, there is participation of 12 users involved in accessing the website. Testing is carried out within 2 minutes, from start to finish. The average response time recorded was approximately 2 seconds. Sessions lasted around 0.95 seconds while reading PDF data files took an average of around 1.2 seconds. The time it takes to display a page is, on average, 1.6 seconds, with the average response time coming from the page source being around 2 seconds.

4.5.2. System Acceptance Testing
The testing process is carried out to verify that the system to be implemented operates correctly. The following are the steps in testing Blackbox Testing:

Table 1. Blackbox Testing Data Menu for Borrowing and Returning Books

Kasus dan Hasil Uji (Data Normal)			
Data Masukan	**Yang Diharapkan**	**Pengamatan**	**Kesimpulan**
Klik *button* Menu Utama Halaman Data Peminjaman Buku	Sistem mampu menampilkan halaman data peminjaman buku	Dapat menampilkan halaman data peminjaman buku	[✓] Berhasil [ ] Gagal
Klik *button Update*	Sistem mampu mengupdate data peminjaman buku	Dapat mengupdate data peminjaman buku dan muncul pesan "*Data updated successfully*."	[✓] Berhasil [ ] Gagal
Klik *button* Cetak Bukti Peminjaman atau Pengembalian Buku	Sistem mampu menampilkan tampilan PDF Bukti peminjaman atau pengembalian buku	Dapat menampilkan tampilan tampilan PDF Bukti peminjaman atau pengembalian buku	[✓] Berhasil [ ] Gagal

Sumber: Hasil Penelitian

5. Discussion

3.4. Application Generation
3.4.1. User Interface
User Interface is a visualization of a program that interacts with users and will be used by them.
1. Login Menu

Figure 5. User Interface Login Menu

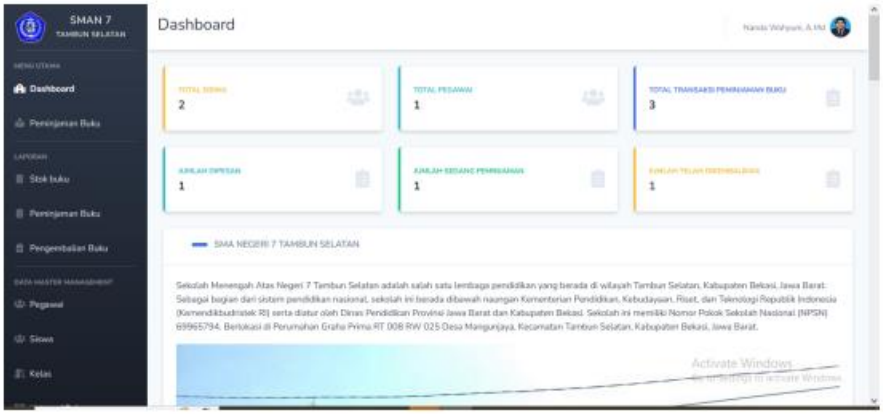


Figure 6. Dashboard Menu User Interface

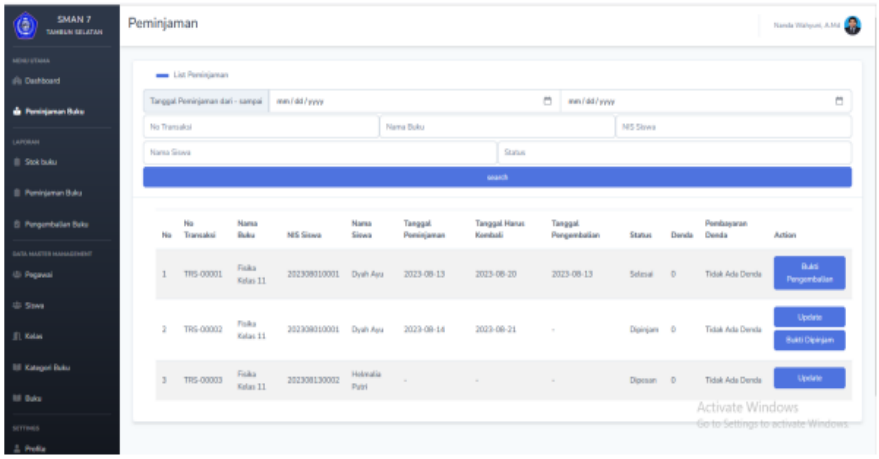


Figure 7 User Interface Data Menu for Borrowing and Returning Books

6. Conclusion

Based on the analysis carried out by the author on library services at SMA Negeri 7 Tambun Selatan, the author will conclude the results of his research: SMA Negeri 7 Tambun Selatan still uses a conventional system in recording book borrowing and returning activities. Therefore, there is an appropriate opportunity to implement a computerized system in managing the recording of book borrowing and returning transactions, as well as managing all library-related information.

The computerized approach makes it easier to search for information about the desired book and can be done anywhere and at any time. The presence of this program can minimize the occurrence of data loss, such as damaged, torn, and wet data, as well as be effective and efficient in producing library data reports for SMA Negeri 7 Tambun Selatan.

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