



Library Management System Design in SMA 6 Madiun

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ABSTRACT

Currently, all library lending, returning and data collection activities at SMA Negeri 6 Madiun are done manually. This is highly inefficient as it wastes paper, generates erroneous data, and results in disorganized and untidy filing. The purpose of this study was to design, build, and implement a website-based library management system at SMA 6. In this study, the system development method used is waterfall. Through the stages of requirements, design, coding and testing, integration and testing, and operations & maintenance. The result of this research is the library management system. The conclusion in this study is that a library management system will be able to improve and make work simpler, faster, and more accurate. can facilitate the management and borrowing of books for librarians and library visitors.

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1. INTRODUCTION

The use of information technology in the world is developing rapidly and has many positive impacts on society. Technology is increasingly being used in many sectors to simplify repetitive and difficult jobs. Libraries will continue to change as technology advances, which allows them to provide convenience, information accessibility, and collaboration with other libraries to share information and achieve common goals [1].

The purpose of the school library is to assist students in obtaining the information they need [2]. To support the learning process in schools or educational institutions, libraries are facilities and infrastructure that must be owned by both schools and educational institutions. They serve as a valuable source of teaching and information. This is a very quiet location which is often used for reading books or looking up references. This location is very useful for students because they can use it to borrow books for free to complete homework. Books are often borrowed, returned, and documented in a handwritten ledger of every action.

In the city of Madiun, East Java, there is a high school called SMA Negeri 6 Madiun. On Jl. Suhud Nosingo, Kel. Mojorejo, Kec. Taman, Madiun City, is where this high school is located. Currently, all library lending, returning, and data collection activities at SMA Negeri 6 Madiun are done manually. This is highly inefficient as it wastes paper, generates erroneous data, and results in disorganized and untidy filing. Employees must verify and physically search for books that have been borrowed. It took a lot of time and effort to do this, and as a result, many books were lost because it was not clear who had borrowed them. As a result, having a system that incorporates library knowledge is critical, especially considering how fast technology is developing.

Researchers will create a website-based library management system based on the problems mentioned above. It is envisioned that the availability of library management systems will improve and make work simpler, faster, and more accurate. can facilitate the management and borrowing of books for librarians and library visitors.

A system is a collection of components that work together in a network regularly to achieve a specific purpose or goal [3]. Information can be interpreted as the result of various data processing that has been arranged in such a way as to suit the needs of the user. Data, on the other hand, refers to a collection of numbers or characters that have a specific meaning and are taken from the reality or situation that exists in a location [4]. Information is also data that has been processed in a way that increases user knowledge [5]. An information system is a group of people and capital resources in an organization that is responsible for collecting and managing data to produce useful information for every level of management in planning and controlling organizational activities [6]. Information systems can be in the form of an organized combination of people, hardware, software, networks, communications, and data resources that are used to collect, modify, and disseminate information within an organization [7]. An information system is a collection of subsystems that store certain data that can be presented and used to make choices [8].

Information and communication technology (ICT) is a resolution to the use of computers, the internet, and other telecommunication technologies in every aspect of human endeavor. Information and communication technology (ICT) is the handling and processing of information (in the form of text, images, graphics, instructions, etc.) for use, through

electronic means and communication devices such as computers, cameras, and telephones [9]. To support the learning process in schools or educational institutions, libraries are facilities and infrastructure that must be owned by both schools and educational institutions. They serve as a valuable source of teaching and information [8]. A website is a collection of connected web pages that can be viewed via an internet connection for individual, business, and organizational needs and includes information in the form of text, photos, animations, audio, and video [10].

HTML is a web programming language that instructs web browsers on how to organize and display content on web pages. HTML is abbreviated as "Hyper Text Markup Language", and its full name is "Hyper Text Markup Language" [11]. PHP is an open-source program used in designing and implementing websites. PHP is a powerful scripting language and is used in a variety of software technologies such as content management applications, online businesses, dynamic website development tools, and chat software custom applications [12]. In the world of web development, PHP is widely used. One of the reasons why PHP is so popular is because it is very easy to learn compared to other scripting languages [13].

The database is a compiled collection of records that can be searched and retrieved digitally from a computer [14]. MySQL is a popular RDBMS that is fast and easy to use for a variety of purposes. MySQL AB Sweden is the company that made it [15]. Frameworks are software with a framework architecture that programmers can use to create desktop, mobile, or web-based applications. It is thought that the basic framework instructions and functions, which can be used to create application software, will enable applications to be created more quickly and with a highly organized structure [16]. Laravel is a framework that can help programmers take advantage of PHP during website creation. Apart from that, Laravel provides several excellent features, including routing, modularity, and a template engine [17]. The relational database conceptual model is represented graphically by an entity relationship diagram (ERD). Entity Relationship Diagram (ERD), often known as the relationship between entities, is a graph that shows how things in the real world are related to one another. Relational database modeling is carried out using ERD [18].

This research is motivated by research gaps in previous studies. Based on the results of research with the title "Web-Based Library Information System Design at SMP N 22 Muaro Jambi" [19]. Based on the results of a research titled "Design of Library Information Systems at MTS Negeri 3 Jambi City" [3]. Based on the results of research with the title "Web-Based Library Information System Design at Stikubank University Semarang" [5]. Based on the results of research with the title "Design of Website-Based Library Information Systems" [20]. shows that in the seven studies, there was no use of a framework in making the website.

The purpose of this study was to design, build, and implement a website-based library management system at SMA 6. The difference between this research and other studies is that this library management system was built using the Laravel framework which has a better security system. One of Laravel's security systems is PDO which can prevent SQL Injection.

2. METHODS

The place of this research is on the Madiun 6 State High School Campus which is located on Jl. Suhud Nosingo, Kel. Mojorejo, Kec. Park, City of Madiun. In this study, the waterfall application development methodology is applied. Through the stages of Requirement,

Design, Coding and Testing, Integration and Testing, and Operation & Maintenance, progress is seen as a continuous flow down (like a waterfall) in a sequential software development waterfall approach [21]. **Figure 1.** is a chart of the waterfall method which can be seen in the image below:

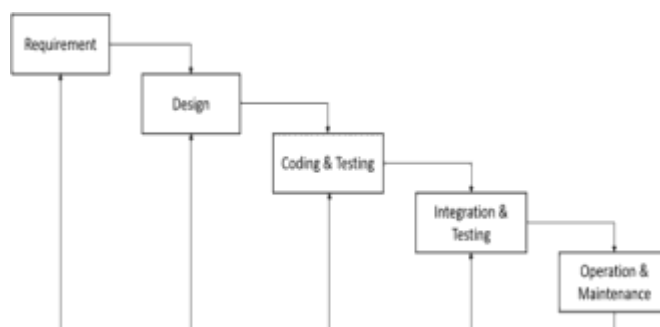


Figure 1. Waterfall method [21]

The stages contained in the waterfall method that the researcher uses are as follows: Requirements (Needs Analysis) On this occasion, the researcher spoke with the librarian at SMA 6 Madiun and saw them in action. These interviews focused on the issues raised by employee complaints, which were then used to determine what requirements should be included in the system design. Design (System Design) Researchers model the system according to the requirements at the design stage of the system to be built. Flowcharts, DFD, ERD, database architecture, and system interfaces are all produced by researchers. Coding & Testing Program code will be generated using Notepad++ during the coding phase. PHP and HTML are the programming languages used. The database application uses XAMPP, and testing is carried out using a black-box testing approach to detect potential system weaknesses and fix them immediately. Integration & Testing (Program Implementation and Testing) At this stage, users or employees will receive a ready-made program to use and run in the SMA 6 Madiun library. Operation & Maintenance (Maintenance) The system that has been operating in the SMA 6 Madiun library is now under maintenance. When maintenance is carried out, bugs are fixed and desired additions or functionality are added [21].

The data collection technique in this study was observation to collect the information needed for system development, such as book data recap, book borrowing, and book return. The researcher made face-to-face observations at the SMA 6 Madiun library. An Interview with The library management team became a research resource to obtain information about issues that were developing at SMA 6 Madiun. The interviews covered the following subjects: book data processing, book borrowing, and book return. Literature Study By reading and reviewing reference materials, the writer uses this strategy to collect data from sources that are relevant to research writing.

4. RESULTS AND DISCUSSION

The result of this research is a website-based library management system at SMA 6. Relevant research studies in this research are based on research with the title Web-Based Library Information System Design at SMP N 22 Muaro Jambi showing that this application can improve librarian performance in managing data faster because the system has data management features for returns and loans [19]. Based on the findings of the study entitled Design of Library Information System MTS Negeri 3 Jambi City, information systems can process data more quickly and easily and do not require a long time to process data, both in

the data search process and in calculating fines [3]. With this method, can provide loan reports more quickly and accurately.

Based on research findings with the title Web-Based Design of Stikubank Semarang University Library Information Systems, library information systems can further accelerate the ability of library administrators to search and facilitate every transaction in the library [5]. and filing is neatly organized because everything is computerized. According to the findings of the study titled Design and Build a Website-Based Library Information System, a web-based library information system can overcome the problems currently experienced by the library at SMP Negeri 1 Pace [20].

The interpretation of the findings in this study is that this library management system is equipped with a login menu, user menu, member menu, book menu, loan menu, loan detail menu, return menu, return detail menu, and reports. The limitations of the research in this study were that this research was only conducted at SMA 6 Madiun. The implication of implementing this library management system is that it can improve and make work simpler, faster, and more accurate. can facilitate the management and borrowing of books for librarians and library visitors. In addition, it makes it easier for users to access the system online.

3.1 System Planning

System planning starts by constructing a Data Flow Diagram (DFD), Entity Relationship Diagram (ERD), and database structure. **Figure 2** is a flowchart for the system admin and **Figure 3** shows Data Flow Diagram (DFD) Level 0 of the system built.

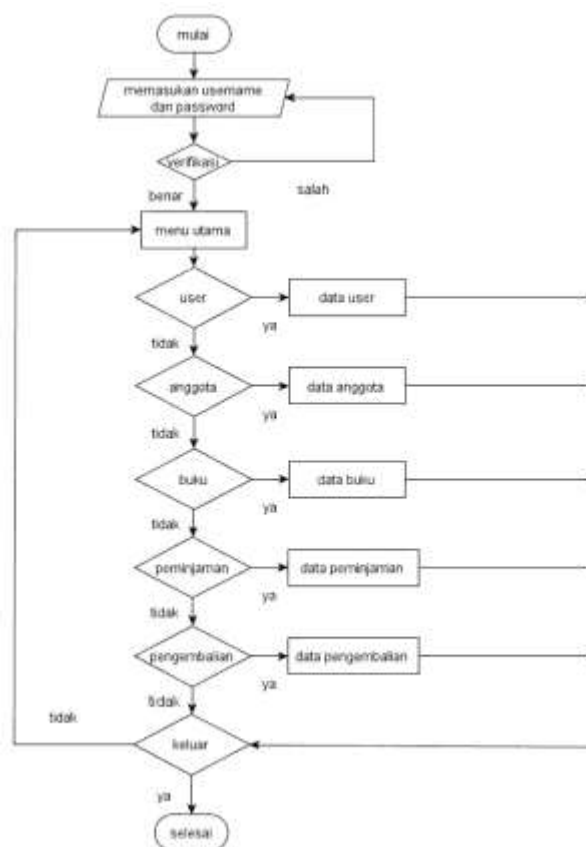


Figure 2. Flowchart Admin

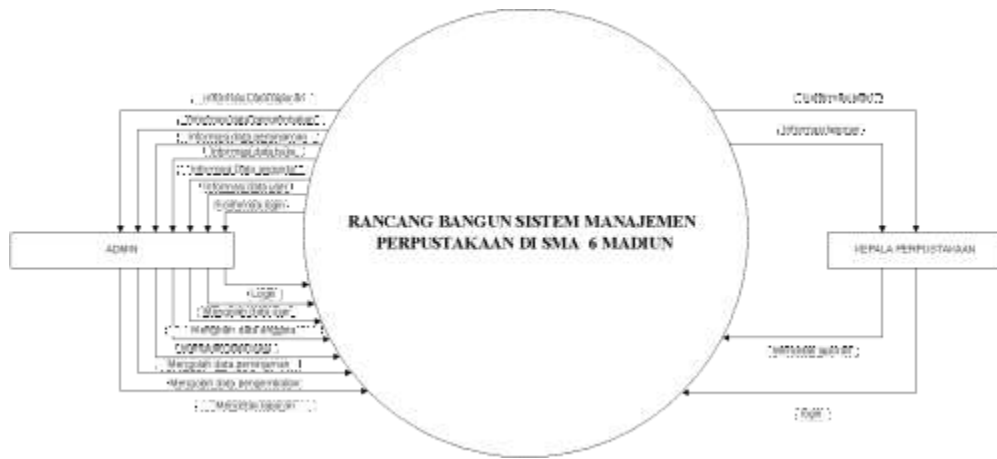


Figure 3. DFD Level 0

Then, **Figure 4.** shows DFD level 1 of the system being built.

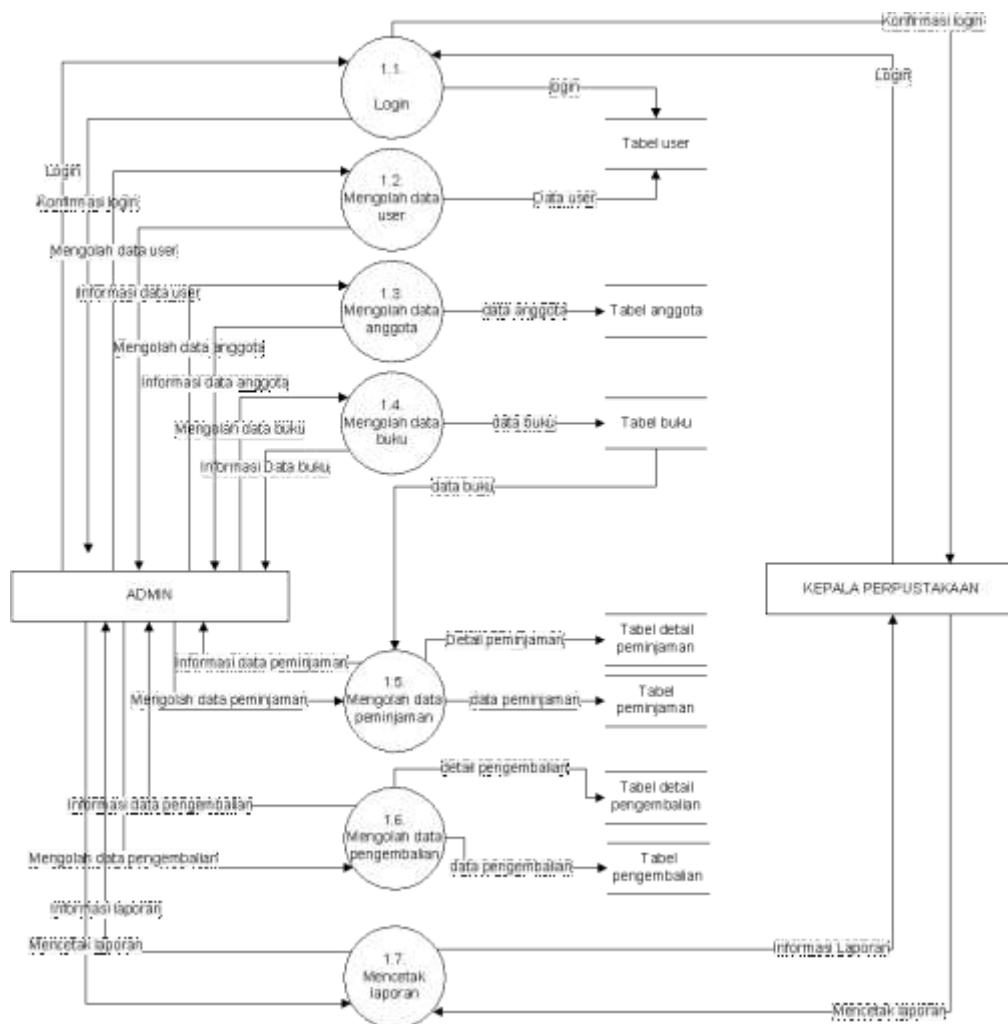


Figure 4. DFD Levels 1

In **Figure 5.**, we can see the Entity Relationship Diagram (ERD) of the system being built.

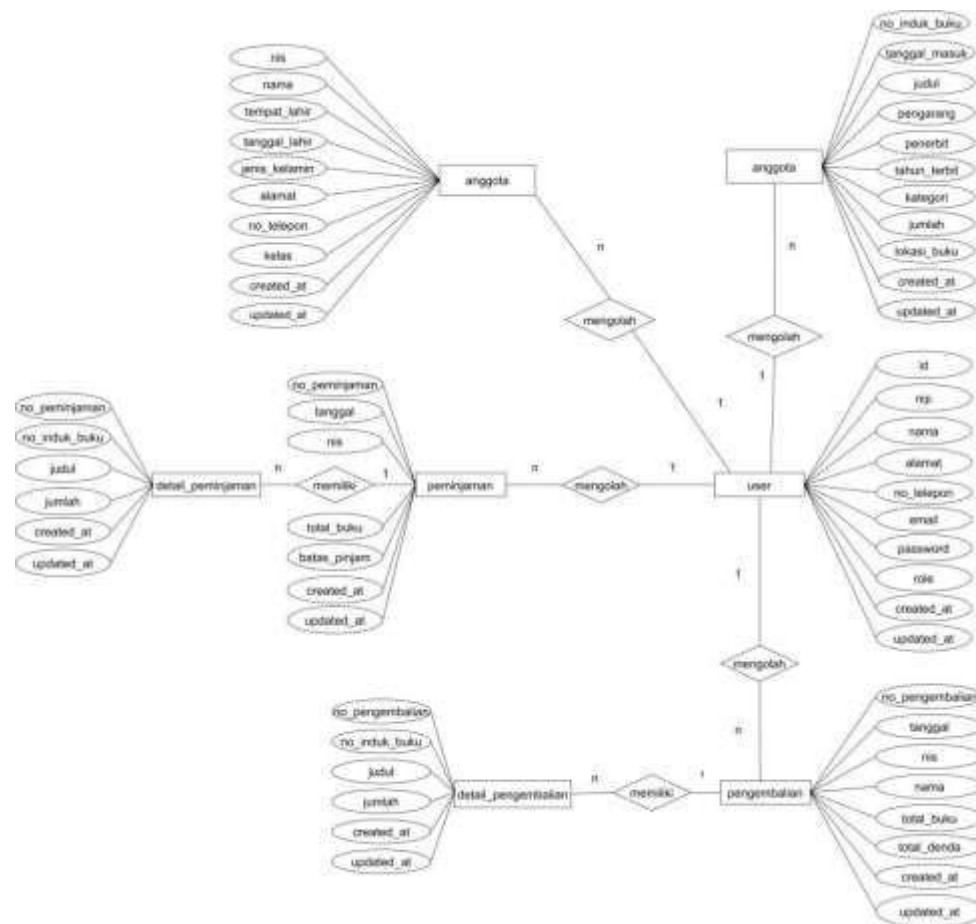


Figure 5. Entity Relationship Diagram of system

For the database structure, there are some tables used. The member table structure is shown in **Table 1**. This table is used to store member data. To store the book data, the database structure follows **Table 2**.

Table 1. Member Table

No	Name	Type	Size	Key type
1	is	int	20	Primary Key
2	nama	varchar	75	
3	tempat_lahir	varchar	25	
4	tanggal_lahir	date		
5	jenis_kelamin	varchar	15	
6	alamat	varchar	100	
7	no_telepon	varchar	14	
8	keys	varchar	15	
9	created_at	timestamp		
10	updated_at	timestamp		

Table 2. Table of Books

No	Name	Type	Size	Key type
1	no_induk_buku	<i>varchar</i>	15	<i>Primary Key</i>
2	tanggal_masuk	<i>date</i>		
3	judul	<i>varchar</i>	100	
4	pengarang	<i>varchar</i>	100	
5	penerbit	<i>varchar</i>	100	
6	tahun_terbit	<i>varchar</i>	4	
7	kategori	<i>varchar</i>	35	
8	jumamah	<i>int</i>	11	
9	lokasi_buku	<i>varchar</i>	50	
10	created_at	<i>timestamp</i>		
11	updated_at	<i>timestamp</i>		

Another database structure for the data used in the system is the borrowing table and the return table. **Table 3.** is the borrowing table structure. This table is used to store loan data. **Table 4.** The table is used to store return data. Here is the return table structure.

Table 3. Loan Table

No	Name	Type	Size	Key type
1	no_peminjaman	<i>varchar</i>	15	<i>Primary Key</i>
2	Tanggal	<i>date</i>		
3	is	<i>varchar</i>	25	<i>Foreign Key</i>
4	nama	<i>varchar</i>	75	
5	total_buku	<i>int</i>	2	
6	batas_pinjam	<i>date</i>		
7	created_at	<i>timestamp</i>		
8	updated_at	<i>timestamp</i>		

Table 4. Returns Table

No	Name	Type	Size	Key type
1	no_pengembalian	<i>varchar</i>	15	<i>Primary Key</i>
2	Tanggal	<i>date</i>		

3	is	<i>varchar</i>	25	<i>Foreign Key</i>
4	nama	<i>varchar</i>	75	
5	total_buku	<i>int</i>	2	
6	total_denda	<i>double</i>		
7	created_at	<i>timestamp</i>		
8	updated_at	<i>timestamp</i>		

3.2 System Development Result

The system is equipped with a login menu for admin. This menu is used to log into the system by entering a username and password. To process the loan data, the system has a borrowing menu as we can see in **Figure 6**. Then to process the restore data, we can use the return menu as shown in **Figure 7**. This menu has some features for adding data, changing data, deleting data, printing data, detailing data, and searching for data.

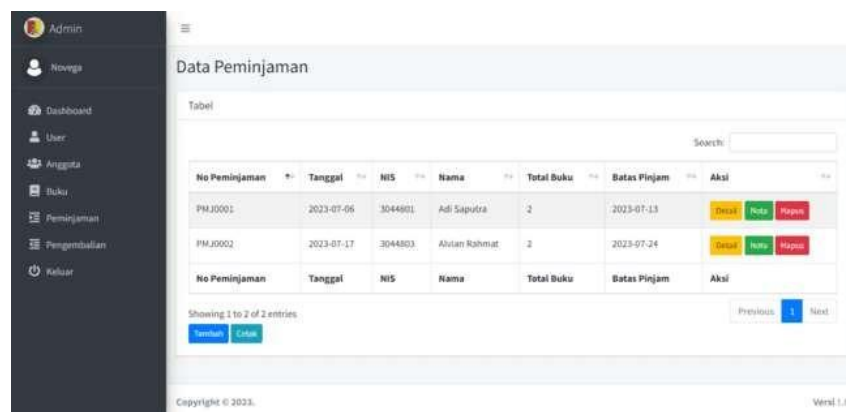


Figure 6. Borrowing menu

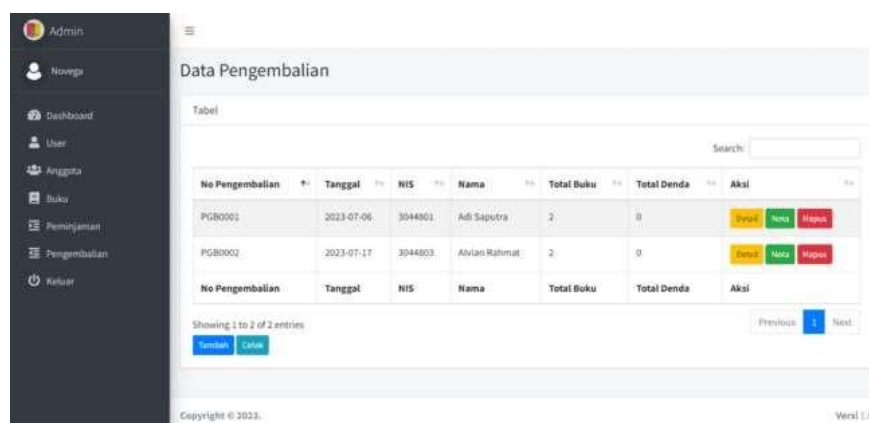


Figure 7. Return menu

Then, a restore menu is also made to process the return data as in Figure 8. This menu has many features, for example, adding data, changing data, deleting data, printing data, detailing data, and searching for data. The system can also generate a PDF file which consists of a loan data report as we can see in **Figure 8**.

No	No Peminjaman	Tanggal	NIS	Nama	Total Buku	Batas Pinjam
1	PM00001	2023-07-06	3044801	Adi Saputra	2	2023-07-13
2	PM00002	2023-07-17	3044803	Alvin Rahmat	2	2023-07-24

Madiun, 2023-07-17
Kepala Sekolah

Pratiwi S.Pd, M.Si
NIP. 19640803 198901 1 002

Figure 8. Loan data report

The report contains the number, loan number, date, nis, total book, and loan limit. A pdf file of the report for the return data can also be generated in the system. This report contains the number, number returns, nis, total books, and total fines. An example of pdf file content can be seen in Figure 9.

No Peminjaman : PM00001
Tanggal : 2023-07-06
Batas Waktu : 2023-07-13

Total Buku : 2
NIS : 3044801
Nama : Adi Saputra

No	No Induk	Judul	Jumlah
1	BK0003	PAI Kelas XII	1
2	BK0002	Bahasa Indonesia Kelas X	1

Madiun, 2023-07-17
Kepala Perpustakaan

Pratiwi S.Pd, M.Si
NIP. 19640803 198901 1 002

Figure 9. Return report

3.3 System Testing Results

The method used by researchers in testing this system is black box testing. Black box testing is software testing in terms of functional specifications without testing the code or the internal side of the program. That is, only the function, interface, and flow are tested without touching the code or script of the software. The results of the black box testing are described in Table 5.

Table 5. Black Box Testing Table

No	Menu	Result		Conclusion
		Normal	Error	
1	Menu <i>Login</i>	✓		Normal
2	Menu Utama	✓		Normal
3	Menu User	✓		Normal
4	Menu Anggota	✓		Normal
5	Menu Buku	✓		Normal

6	Menu Peminjaman	✓	Normal
7	Menu Detail Peminjaman	✓	Normal
8	Menu Pengembalian	✓	Normal
9	Menu Detail Pengembalian	✓	Normal

4. CONCLUSION

The conclusion of this study is to design and build a website-based library management system using HTML and PHP programming languages. The PHP framework uses Laravel. The CSS framework uses bootstrap. The database system uses MySQL. XAMPP and Visual Studio Code supporting applications. In designing using flowcharts, ERD, DFD level 0 and level 1. Testing the system using the black box testing method. The test results in system testing show that all features in the system run normally. Implementing a website-based library management system. The results of the implementation have been carried out by installing a library management system on the Madiun 6 High School library computer starting with the XAMPP installation and then installing the system.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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