Jurnal Informasi dan Teknologi

https://jidt.org/jidt

2025 Vol. 7 No. 3 Page: 39-44 e-ISSN: 2714-9730

# Website-based Library Information System at SMK Muhammadiyah Adiwerna

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**Abstract**

This study aims to design and develop a web-based library information system to enhance the efficiency and accuracy of library management at SMK Muhammadiyah Adiwerna, Tegal Regency. The main issues previously encountered were error-prone manual recording, slow data retrieval, and difficulties in generating reports. The system was designed using the waterfall method with PHP as the programming language and MySQL as the database. The key features developed include book borrowing and returning records, book and member data management, as well as customized dashboard displays for administrators and users (teachers/students). System testing was conducted using the black box testing method on the main functionalities. The test results indicate that the system operates in accordance with the specifications and user requirements. This system has successfully improved the efficiency, speed, and ease of access to library information.

**Keywords:** *Information System, Website, Library, Vocational High School.*



## 1. Introduction

School libraries are one of the essential facilities that serve as centers of knowledge and support the teaching and learning process for both students and teachers. In the digital era, many libraries still relying on manual systems have proven to be ineffective due to their vulnerability to recording errors and difficulty in data retrieval [1]. This condition encourages the need for a modern and efficient web-based library information system.

Library digitalization has become an essential solution to overcome the limitations of manual systems. A web-based system is able to integrate collection management, borrowing, and returning transactions, while also accelerating information access [2]. With such a system, schools can improve service quality and make it easier for students and teachers to obtain the reading materials they need.

A study in Malaysia revealed that the Web-Based School Library Management System (WBSSLMS) significantly improved efficiency in acquisition, cataloging, searching, and circulation, and was also easy to use for both students and librarians [3]. These findings demonstrate that the application of information technology in school libraries has a real impact on service effectiveness.

In Indonesia, research conducted at Athirah Islamic School Makassar showed that the development of a digital library using the ADDIE-Waterfall method achieved high levels of validity and effectiveness, making it feasible to implement at the school level [4]. This finding emphasizes that the implementation of a digital library system can optimally meet users' academic needs.

Moreover, a study in Labuhanbatu revealed that training on web-based library information systems significantly enhanced school librarians' service abilities. The evaluation recorded a high feasibility score, with results above 86% [5]. This demonstrates the importance of improving human resource capacity in supporting the success of system implementation.

The use of Senayan Library Management System (SLiMS) as an open-source solution in several Indonesian schools has also proven to be effective and efficient. This system helps librarians manage book transactions, members, and reports in a more structured and transparent manner [6]. A major advantage of SLiMS is its compatibility with schools that have limited resources.

The concept of a web-based library also enables the integration of various media types, including text, images, audio, and video. This broadens students' access to diverse information sources, increases system reliability, and strengthens the role of libraries as digital learning centers [7]. Thus, digital transformation not only simplifies administration but also enriches students' learning experiences.

Library digitalization is also considered crucial in the context of national education development. A study in Indonesia stressed that digital libraries can serve as strategic facilities to transform libraries into active, relevant knowledge centers that support students' literacy development [8]. This aligns with the goal of improving education quality through strengthening reading culture.

Receipt: 28-01-2025 | Revision: 11-05-2025 | Publish: 01-08-2025 | doi: 10.60083/jidt.vi0.672

In addition to web-based systems, some schools have begun to use mobile-based services to expand access to digital libraries. These services allow students to access catalogs and digital books through mobile devices, thus enhancing user flexibility and convenience [9].An evaluation of the SLiMS-based library system using ISO 9126 standards showed that it meets criteria for functionality, reliability, usability, and efficiency. Therefore, this system is highly relevant for implementation in Indonesian schools [10].
The benefits of applying a web-based library system are not limited to improving librarians' efficiency but also providing transparency in borrowing and returning transactions, which can be accessed anytime by both students and teachers [7]. This makes libraries more responsive to users' needs.
Based on these findings, the implementation of a web-based library information system at SMK Muhammadiyah Adiwerna is a strategic step. This system not only improves efficiency and accuracy in management but also has the potential to foster students' reading interest and support digital transformation in education [8].

## 2. Research Methods

This research employed the waterfall method as the main approach in system development, which is part of the System Development Life Cycle (SDLC). The waterfall model was selected because it provides a systematic and sequential framework, starting from requirement analysis, system design, implementation, testing, deployment, and continuing with maintenance. At the initial stage, a comprehensive needs analysis was conducted by gathering information related to the library management requirements at SMK Muhammadiyah Adiwerna. This analysis served as the foundation for determining the specifications of the web-based library information system to be developed.
The design stage involved the creation of system architecture, database structures, and user interface design. The design process utilized the Unified Modeling Language (UML) to visualize system functions and data flow effectively. Furthermore, the system was developed using PHP as the programming language and MySQL as the database management system. This combination was chosen because it is reliable, user-friendly, and widely adopted in web-based applications.
Implementation was carried out by coding the system according to the design specifications. At this stage, features were developed to accommodate book management, member registration, borrowing and returning transactions, as well as differentiated dashboard displays for administrators and users (teachers/students). Once the coding process was completed, testing was conducted using the black box testing method, which focuses on verifying the functionality of each feature without examining the internal code structure. The goal was to ensure that the system operated as expected and met user requirements.
The data required for this study consisted of both primary and secondary sources. Primary data were collected through observations of the library activities at SMK Muhammadiyah Adiwerna and interviews with librarians to identify problems and user needs. Secondary data were obtained from literature reviews, relevant journals, and documentation related to library management systems. The combination of these data sources ensured that the system design was accurate, relevant, and in line with the real conditions and expectations of the school library environment.

## 3. Results and Discussion

### 3.1. Results

#### 3.1.1. Login Menu Display

This menu display is the same as the display when logging into the information system. Both administrators and users have the same display.

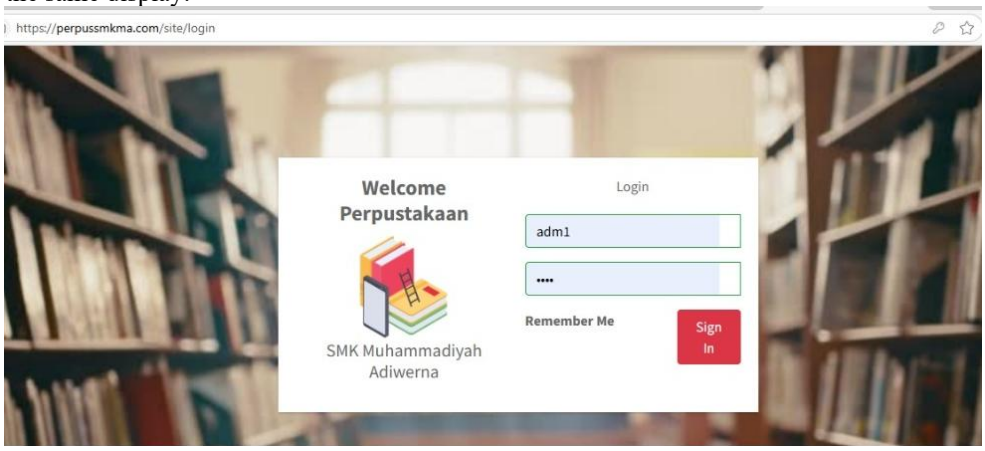


Figure 1. Login Menu Display

### 3.1.2. Admin Dashboard Menu Display

The admin dashboard menu has several menus for managing book additions, category input, loan data input, and managing both teacher and student users. In this case, the admin can be referred to as the library manager or librarian, who previously used a ledger to record the books that were borrowed.

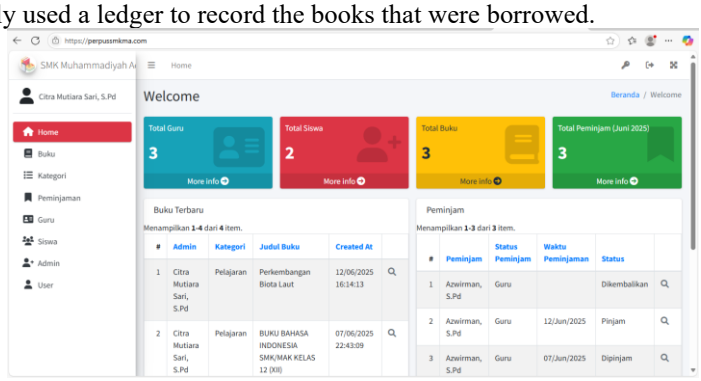


Figure 2. Login Menu Display

### 3.1.3. User Dashboard Menu Display (Teacher/Student)

This library information system, referred to as users, consists of teachers and students who are allowed to borrow items or as members of the library. The display is as follows:

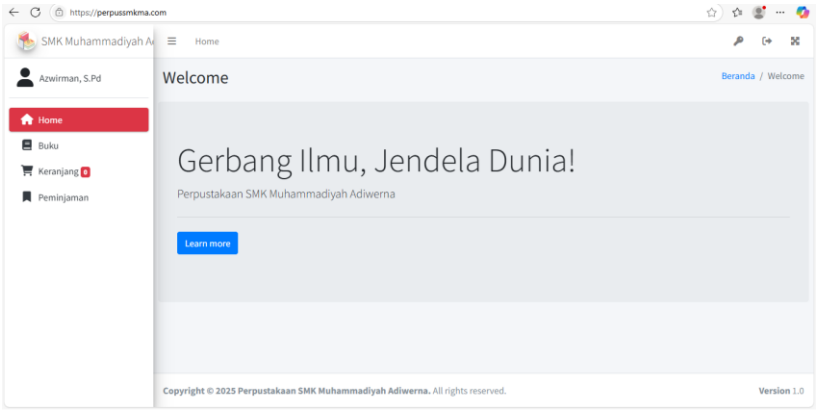


Figure 3. Login Menu Display

### 3.2. Discussion

Table 1. Test Result

| No | Feature Name | Tested Input | Expected Results | Actual Results | Status |
|---|---|---|---|---|---|
| 1 | Login | Valid username & password | Successfully logged into the dashboard | Compliant | Passed |
| 2 | Login | Incorrect username/password | Error message appears | Compliant | Passed |
| 3 | Book Management | New book data input | Book successfully saved | Compliant | Passed |
| 4 | Book Management | Edit book data | Changes saved | Compliant | Passed |
| 5 | Book Management | Delete book data | Book data deleted from database | Compliant | Passed |
| 6 | Book Categories | Add book category | Category saved in database | Compliant | Passed |

| | | | | | |
|---|---|---|---|---|---|
| 7 | Book Loans | Add book borrowing by user | Loan data recorded | Compliant | Passed |
| 8 | Book Returns | Input return date | Book status changed to "Returned" | Compliant | Passed |
| 9 | User Management (Teachers/Students) | Add member data | Data saved and able to log in | Compliant | Passed |
| 10 | Teacher/Student Dashboard | View book collection | Book data displayed according to database | Compliant | Passed |
| 11 | Book Search | Enter title keyword | Relevant search results displayed | Compliant | Passed |

**3.2.1. System Functional Reliability**

The web-based library management system developed at SMK Muhammadiyah Adiwerna was thoroughly tested using the black box testing method. Literature indicates that factors such as usability, functionality, and reliability significantly influence user satisfaction during library system adoption [11]. The test results showed that key features such as login, book management, and transactions ran according to specifications and remained stable without errors. This demonstrates that the system was implemented with a well-designed and reliable framework.

Furthermore, the analysis revealed that the system performed as expected without functional disruptions, indicating a high level of reliability. This aligns with a case study at Aston University Library, where the implementation of a library management system improved service efficiency and staff satisfaction [12]. Thus, the system created not only meets the basic requirements but also provides a satisfactory user experience.

Focusing on usability aspects is equally important to ensure system effectiveness. Research developing usability checklists for web-based library systems emphasizes that responsive and user-friendly interfaces maximize user experience [13]. In this system, intuitive navigation, relevant search features, and simple user interface design were tested to ensure high readability for both librarians and users.

Overall, the system fulfills the functionality and reliability standards required in a school library context. The combination of systematic functional testing and evidence-based design makes the system feasible for operation within the formal educational environment of SMK Muhammadiyah Adiwerna, without significant obstacles during the evaluation stage [11].

**3.2.2. Improving Library Service Efficiency**

The implementation of Artificial Intelligence (AI) in medical diagnostics cannot be optimized without adequate technological infrastructure. Observations and interviews at RSUDAM revealed that the hospital already has a Hospital Management Information System (SIMRS) and an Electronic Medical Record (EMR) system, which form the foundation for clinical data integration. However, these systems have not yet fully supported the automatic operation of AI software due to limitations in interoperability, network speed, and server storage capacity. This indicates that RSUDAM's technological readiness is still at an early stage of digital adoption, not yet reaching the level of full integration needed for real-time AI utilization.

The implementation of the web-based system has automated the borrowing and returning processes, thus accelerating services without compromising data accuracy. A case study at Aston University Library found that such systems significantly improved operational efficiency and reduced staff workload [12]. A similar impact was observed at SMK Muhammadiyah Adiwerna, where transaction records are now handled more quickly.

With data automation, library reports that previously required several days to compile manually can now be generated within minutes. Studies on library management systems also indicate that automated reporting integration greatly assists decision-making based on accurate and timely data [14]. The school can now access updated statistics without relying on error-prone manual methods.

This efficiency has also influenced librarians' time allocation. Time previously spent on manual record-keeping has now been redirected to strategic tasks, such as managing new collections, providing literacy services, and assisting students in their learning activities. This not only enhances staff productivity but also enriches the library's contribution to daily teaching and learning processes.

The system functions not only as an administrative tool but also as a mechanism to professionalize library services. Schools can now use their time and resources more effectively, producing services that are more responsive and consistently supportive of a school-wide literacy culture [12].

### 3.2.3. Impact on Increasing Students' Reading Interest

Quick access to digital catalogs and collections through the web-based system has had a positive impact on students' motivation to read. A meta-analysis in Indonesia concluded that library technology and infrastructure are major factors shaping students' reading interest [17]. This aligns with field experiences, where students feel more motivated to explore reading materials.

Research on the "Go Reading" digital library application also showed that the platform significantly improved students' independent learning and reading interest during online learning [3]. Easy and flexible access encouraged students to actively seek reading materials, not limited to physical library hours but available anytime via their personal devices.

In addition, an interactive and transparent system helps students feel valued as users. With features that allow them to view book availability, borrowing history, and reading recommendations, students' interest in reading grows organically. This reinforces findings that digital library services contribute to building sustainable reading habits among students [17].

Overall, the system serves not only as an administrative tool but also as a literacy instrument that motivates students. With easy digital access and responsive features, the library becomes a learning space where reading interest can thrive, aligning with the vision of holistic education based on literacy culture [14][16][17].

### 3.2.4. Future Development Potential of the System

Future development of the system may include integrating modern technologies such as QR codes or barcodes to accelerate borrowing and returning procedures. A study on ILMS implementation in educational institutions suggested QR code integration as a key feature to enhance transaction speed and data accuracy [14]. This would simplify the process for both librarians and users.

Automatic features such as book return reminders through notifications could also be implemented. Sending reminders via email or messaging applications increases user engagement and helps minimize late returns. This approach further supports transparency and service continuity in the library.

Additionally, implementing automatic statistical reports—such as most borrowed books, most active members, and monthly borrowing trends—would be a strategic asset for schools. These statistics would help evaluate collection effectiveness and design more targeted literacy programs, as well as support evidence-based policy-making in library management [19].

Ultimately, users' perceptions of the system are strongly influenced by its functionality and usability. Therefore, further development should continue to optimize these aspects to maintain the quality of user interaction and ensure the system remains relevant over time [13]. With an iterative approach, the system could evolve into a leading digital literacy platform in the educational environment.

## 4. Conclusion

The development and implementation of the web-based library information system at SMK Muhammadiyah Adiwerna successfully addressed the limitations of the previous manual system. Through systematic design using the waterfall method and functional testing with the black box approach, the system proved to be reliable, user-friendly, and capable of meeting the essential needs of both librarians and users. Its functionality and reliability ensure that library services can operate more effectively and consistently, thus replacing inefficient manual processes.

The system has significantly improved service efficiency by automating borrowing and returning transactions, streamlining data management, and enabling the generation of accurate reports in a short time. This efficiency not only reduces the workload of librarians but also provides students and teachers with faster and easier access to information. Moreover, the system positively impacts students' reading interest by offering transparent and convenient access to library resources, thereby strengthening the literacy culture in the school environment.

Looking ahead, the system presents substantial potential for further development, such as integrating QR codes for faster transactions, implementing automated notifications, and providing advanced statistical reporting. These enhancements would not only optimize the functionality of the system but also support evidence-based decision-making for the school. Ultimately, the system is expected to become a sustainable digital literacy platform that contributes to educational quality and prepares students for a more digitalized learning environment.

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