Design of Bangka District Regional Library Information System Based on Website

Muhammad Deva Ronaldo[1], Chaca Ananda Putri[2], Muhammad Zaki[3], Dimas Firmansyah[4], Sanditias Satria Wicaksana[5], Muhammad Fauzan[6], Aziz Budiarjo[7], Nurhaeka Tou[8*]

[1,2,3,4,5,6,7,8] Department of Information Technology, Universitas Bangka Belitung, Balunijuk, Merawang, Bangka, Bangka Belitung Islands 33172, Indonesia
*[1]devrnaldo@gmail.com, [2]chacaputripkp@gmail.com, [3]mhmmdzaki@gmail.com, [4]dimasfirmansyah657@gmail.com, [5]sanditiassatria@gmail.com, [6]muhammadfauzann503@gmail.com, [7]azizbuarjo05@gmail.com, [8]nurhaeka@ubb.ac.id**

ARTICLE INFO

Article history:
Received: March 23, 2024
Accepted: May 8, 2024
Published: May 8, 2024

Keywords:
Library
Information System
UML
Website

ABSTRACT

This research aims to overcome the challenges faced by the Bangka Regency Regional Public Library (Perpusda) in the book lending process which is still done manually. Currently, visitors must register as members through a system that can only be accessed on-site with the help of library staff, indicating the need for a more efficient solution in managing library data. Thus, this research aims to develop a website-based library information system that can simplify the process of member registration and book borrowing, as well as improve the efficiency of overall library data management. The system development method used is the *Waterfall* method, which allows the stages of system development to be carried out in a structured manner, starting from needs analysis, design, implementation, to system testing. The result of this research is the design of a web-based library information system that has been successfully developed. This system has been tested and demonstrated at the Bangka Regency Library, and the results show that the implementation of this system will make a significant contribution in improving the efficiency of library data management. Thus, this library information system is expected to provide great benefits for librarians and library users in accessing and managing information more efficiently.

INFO ARTIKEL

Proses Artikel:
Diterima di sistem: 23 Maret 2024
Dinyatakan diterima: 8 Mei 2024
Diterbitkan: 8 Mei 2024

Kata Kunci:
Perpustakaan
Sistem Informasi
UML
Website

ABSTRAK

Penelitian ini bertujuan untuk mengatasi tantangan yang dihadapi oleh Perpustakaan Umum Daerah Kabupaten Bangka (Perpusda) dalam proses peminjaman buku yang masih dilakukan secara manual. Saat ini, pengunjung harus mendaftar menjadi anggota melalui sistem yang hanya dapat diakses di tempat dengan bantuan petugas perpustakaan, menunjukkan perlunya solusi yang lebih efisien dalam pengelolaan data perpustakaan. Dengan demikian, penelitian ini bertujuan untuk mengembangkan sebuah sistem informasi perpustakaan berbasis website yang dapat mempermudah proses pendaftaran anggota dan peminjaman buku, serta meningkatkan efisiensi pengelolaan data perpustakaan secara keseluruhan. Metode pengembangan sistem yang digunakan adalah metode *Waterfall*, yang memungkinkan tahap-tahap pengembangan sistem dilakukan secara terstruktur, mulai dari analisis kebutuhan, perancangan, implementasi, hingga pengujian sistem. Hasil dari penelitian ini adalah rancang bangun sistem informasi perpustakaan berbasis website yang telah berhasil dikembangkan. Sistem ini telah diuji coba dan demonstrasi di Perpusda Kabupaten Bangka, dan hasilnya menunjukkan bahwa implementasi sistem ini akan memberikan kontribusi yang signifikan dalam meningkatkan efisiensi pengelolaan data perpustakaan. Dengan demikian, sistem informasi perpustakaan ini diharapkan dapat memberikan manfaat yang besar bagi pustakawan dan pengguna perpustakaan dalam mengakses dan mengelola informasi secara lebih efisien.

I. Introduction

The library is an integral part of the education world. Presently, the library plays a crucial role in enhancing the understanding and knowledge of learners. A library is an organizational work system or activity that involves a group of individuals working together and organizing [1]. The rapid development of technology significantly influences the advancement of libraries. This is due to the importance of the library's role in both the educational and general community scopes. Therefore, it is crucial to ensure that the provided information remains up-to-date [2].

The Regional Public Library of Bangka Regency (Perpusda) is one of the libraries managed by the Regional Government of Bangka Regency. This library provides various types of books that can be read or borrowed by the general public. The book borrowing process at Perpusda is currently still carried out manually, where visitors must first register as members through a system that can only be accessed on-site with the assistance of library staff there.

The manual borrowing process often encounters various challenges. Currently, various obstacles are faced if library data is still managed manually. One of them is the time required to find a book. Additionally, library staff will face difficulties in managing borrowing and return data, which are prone to errors, and they will also struggle to check books that are no longer needed. To address the issues of information delay and the management of detailed book collection data, a shift from manual library data processing to computer-based data processing is needed. A library information system is a computerized data processing process within a library. Library information systems are easier to use for library staff and library users compared to conventional libraries because they allow them to continuously monitor book availability, new book lists, book borrowings, and returns [3].

Based on the above problems, this research is expected to improve the efficiency of library data management in providing more accurate and up-to-date information, both for library users and librarians. Some references used for this research include: (1) Based on the research results of Firman A, Wowor H, and Najoan X. (2016) titled "Web-Based Online Library Information System". The existing information system development at the Faculty of Engineering Library, Sam Ratulangi University, Manado, used the *waterfall* method. This application was created using *PHPMyAdmin* and assisted by the *Adobe Dreamweaver* application to design the information system interface. This application helps the recording process with the automation of borrowing, returning, and borrowing requests, and helps speed up the book search process for library members [4]. (2) From the research results of Budihartanti C, Tuslaela, Aeni N. (2019) titled "Online Library Information System (E-LIBRARY) at MTs AL Maghfiroh Pekayon in 2019", it was concluded that the e-library information system at MTs Al Maghfiroh, it can help members of the library and librarians to quickly search for desired book data online. Members of the library only need to stay at home to obtain book information and can borrow books more easily online [5]. (3) Based on the research results of Harjono W and Kristianus Jago Tute (2022) titled "Designing a Web-Based Library Information System Using the *Waterfall* Method in 2022", this web-based library helps library staff easily complete membership registration procedures, borrowing, returning books, and manual fine calculations. With this system, all data will be securely stored in the database, thereby avoiding data damage and loss [6]. (4) From the research results of Octaviani A and Dewi P (2021) titled "Library Information System Development to Manage Library Data in 2021", it was found that a library information system, especially in library automation systems, includes management, processing, storage, and distribution of useful library data to assist librarians [7].

II. Methodology

The data we used in this study are primary and secondary data. Primary data were obtained through direct data collection methods, namely interviews and observations on September 14,

2023, at the National Library of Pangkalpinang City and on September 15, 2023, at the Bangka District Regional Library.

The system development method used in the design of this library information system is the *waterfall* method. *Waterfall* method is a commonly used system development model, both in large and small industries [8]. *Waterfall* emphasizes documentation with a sequential system presenting the processes of analysis, design, coding, testing, and support. The flow of the *waterfall* model can be seen in Figure 1.

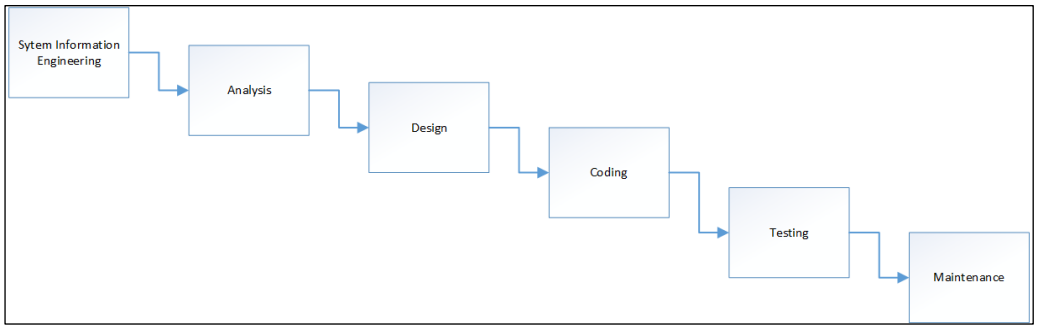

Figure 1. *Waterfall* Method

To obtain highly accurate, relevant, and reliable data, we conducted observations, interviews, and literature studies in data collection, followed by data requirement analysis, implementation, and testing. The research flow can be seen in Figure 2.

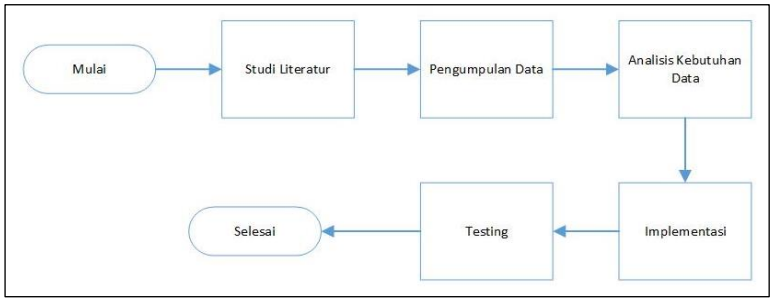

Figure 2. Research Flow Diagram

The research on the design and development of this library information system was conducted by searching various literature sources, including journals, articles, books, or other research materials. Subsequently, data collection was carried out using several methods, including: (1) interviews; (2) observations; (3) literature review, followed by conducting data requirement analysis. At this stage, data requirement analysis is needed to identify the problems existing in the manual library information system and to determine what librarians need to manage book data systematically.

During the implementation phase, the programming language used is *PHP* with database storage on *XAMPP*.

III. Results

The results of our research yield several system designs shown as Figure 3. The first one is the use case diagram. Based on Figure 3, the above use case involves 2 actors: users and librarians. First, both users and librarians need to log in by entering their username and password. Within the system, users can access the dashboard, borrowing history, profile, search for books, borrow books, and then log out when finished. Meanwhile, librarians within the system can edit or manipulate user data, edit book data, process borrowings and returns, generate reports, and view graphical reports.

The second one is the class diagram. The design result of the online library class diagram consists of various classes: login class, user class, librarian class, book data class, borrowing class, return class, and monthly report class.

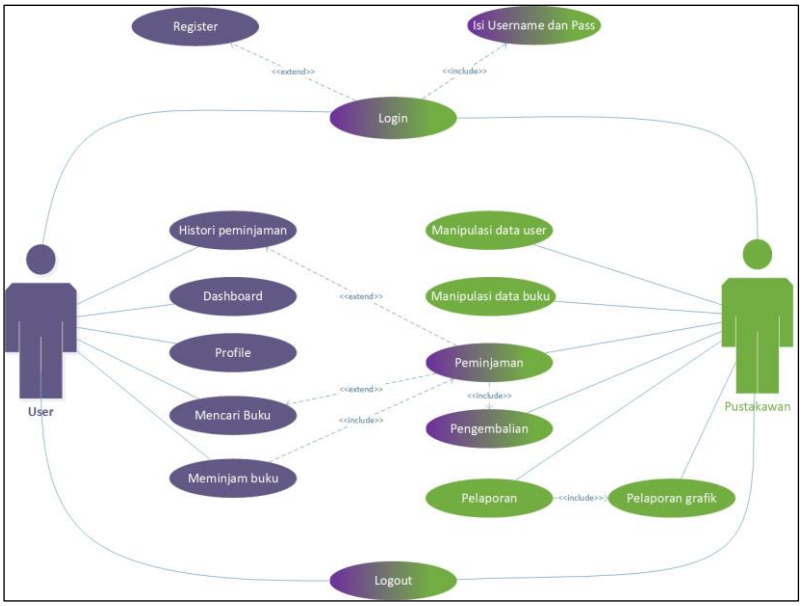

Figure 3. Use Case Diagram

Based on Figure 4, the classes above are interconnected. The login class is related to the user class and librarian class. The librarian class is related to the book data class and monthly report class. The borrowing class is related to the user class, librarian class, and book data class. The monthly report class is related to the book data class. The return class is related to the book data class, user class, librarian class, borrowing class, and monthly report class.

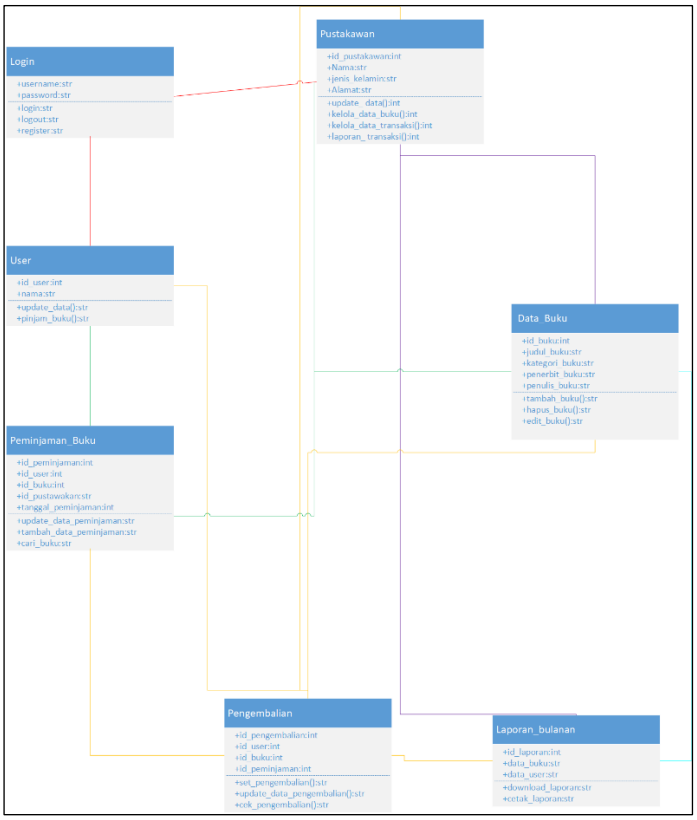

Figure 4. Class Diagram

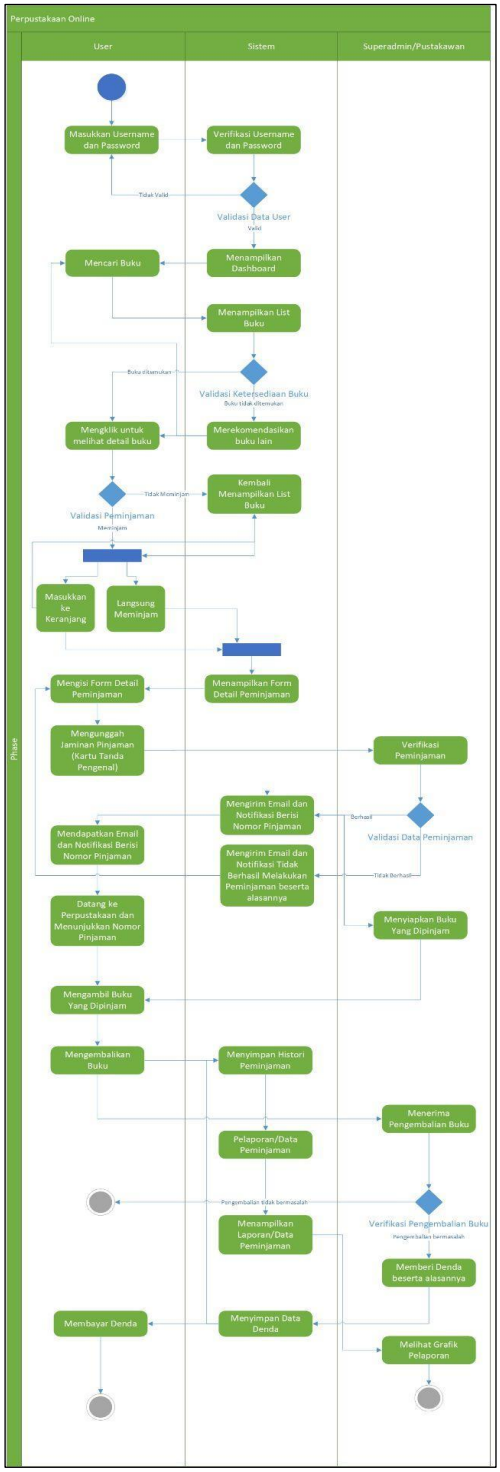

Figure 5. Activity Diagram

Then the third one is the activity diagram. Based on Figure 5 above, the activity diagram involves 3 actors: user, system, and librarian. First, the user logs in by entering their username and password, which will be verified by the system. If the password and username are validated, the system will display the system dashboard. Next, the user can search for books to borrow, and the system will display a list of available books. If the desired book is not available, the system will provide book recommendations or allow the user to search again. In the next step, the user can click on the book details, where they can borrow it or wait if the book availability status is not yet available. Then, the system will display the borrowing details, and the user can fill out the borrowing form and upload identification, which will be validated by the librarian.

The system will send a notification via email if the borrowing is successful, along with the borrowing number. Next, the librarian will prepare the book for borrowing, and the user can collect the book by providing the borrowing number to the librarian. When the user returns the book, the system will record the borrowing history.

IV. Discussion

The Bangka District Regional Library initially had a manual book borrowing system that required library visitors to come to the location and register as members before they could borrow books. The borrowing and returning processes were also done manually, leading to errors in data entry. Additionally, the manual data processing posed a challenge for librarians in sorting through books that were no longer needed.

To address the issues related to library information system data processing, a web-based library information system was developed, allowing library visitors to access it from anywhere.

Here is the prototype display of the Bangka District Regional Library Information System Based on Website, generated from the system design conducted earlier.

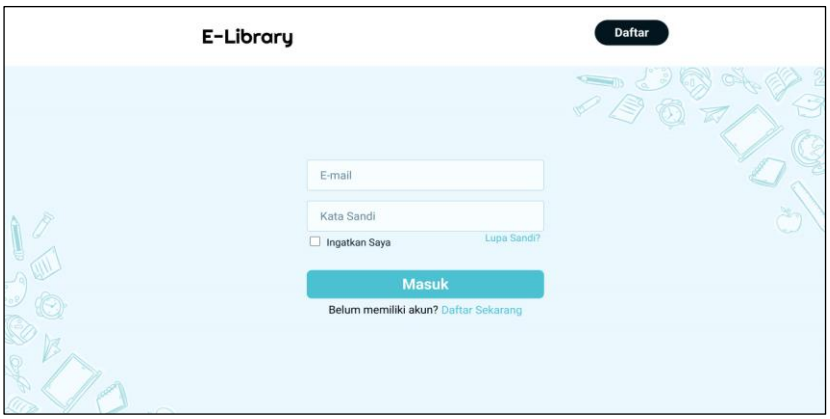

Figure 6. Login Page

In Figure 6, there is a login page where users can enter their email and password to access the online library system homepage. Additionally, there are features such as "Forgot Password?" where users who have an account but forget their password can click this feature. Then, there is a "Remember Me" feature, which functions to remember or save the email and password used by the user to log in on the browser being used. If users do not have an account yet, they must first register by clicking "Register Now" or the "Register" button in the top right corner, then they will be directed to fill out personal information on the registration page.

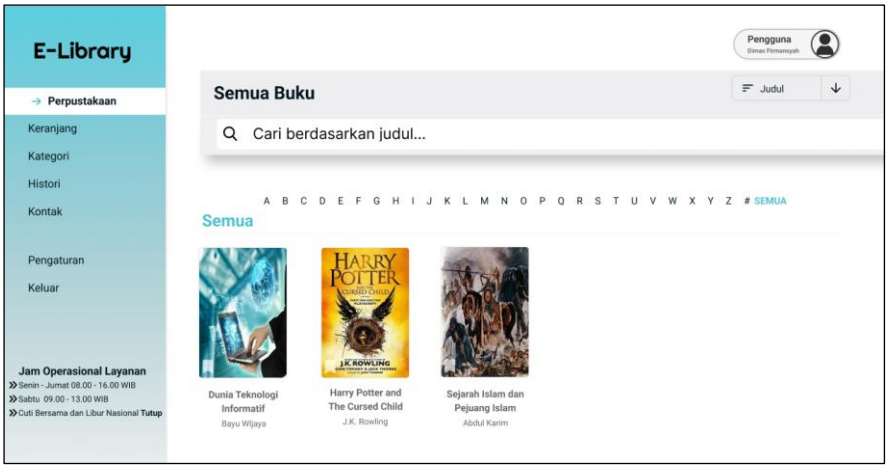

Figure 7. Homepage Display.

Then in Figure 7, there is a homepage which serves as the main page of the designed website. This page displays all the books owned by the Bangka District Regional Library, which can be searched using the search bar or by clicking on the alphabetical filter below it. On the left side, there is information about service hours and several menus such as "Library", which is the main menu or homepage, then the "Cart" menu where users can see which books have been added to the cart before borrowing, the "Categories" menu as shown in Figure 9, the "History" menu which is used to view borrowing history, the "Contact" menu containing contact information and a brief description of the Bangka District Regional Library, the settings menu for customizing the website appearance, and the logout menu which functions to log out the user and return to the login page. In the top right corner, there is a user icon and their name. When clicked, the user will be directed to their user profile page.

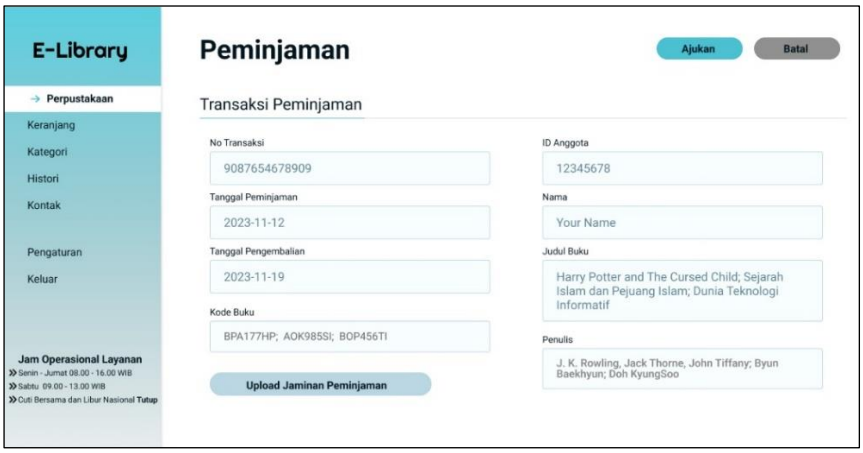

Figure 8. Borrowing Form Display.

Figure 8 shows the page displaying the borrowing form, which appears after the user requests to borrow a book either directly from the book detail page or from the cart. This page contains several pieces of information such as Transaction Number, Borrowing Date, Return Date, Book Code, Member ID, Name, Book Title, and Author. At the bottom, there is an "Upload Borrowing Guarantee" button that users can click to upload a borrowing guarantee as a mandatory requirement for borrowing books. This guarantee can be in the form of an identity card, student card, school card, or family card. After uploading the borrowing guarantee, the user can click the "Submit" button to borrow the book, or the "Cancel" button located in the top right corner.

Figure 9. Book Category Display.

Next, Figure 9 shows the display of the "Categories" menu page, where users can search for or view the book categories owned by the Bangka District Regional Library. To search for book categories, users can use the search bar at the top, or they can directly click on the desired book category, such as Technology, History, Novel, Law, etc. At the bottom, there are also recommended books, which can serve as references for users.

Figure 10. Book Borrowing Approval Display.

In Figure 10, we see the borrowing approval display where librarians can approve or reject borrowings by first reviewing the member's name, member ID, book ID, book title, category, and details of the intended book borrowing. Additionally, the borrowing approval display includes a search feature, which facilitates librarians in finding specific data. This search feature is designed to enhance efficiency in data retrieval for librarians.

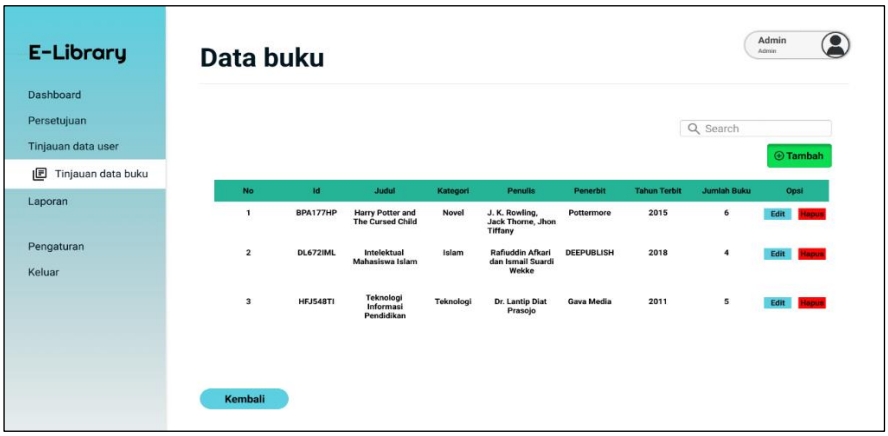

Figure 11. Book Data Display.

In Figure 11, there is a book data display showing the book ID, book title, book category, book author, book publisher, publication year, and the number of books. Additionally, there are several additional features, such as a search column that enhances data search efficiency, an add book feature to add new books, and edit and delete features that facilitate librarians in editing and deleting data.

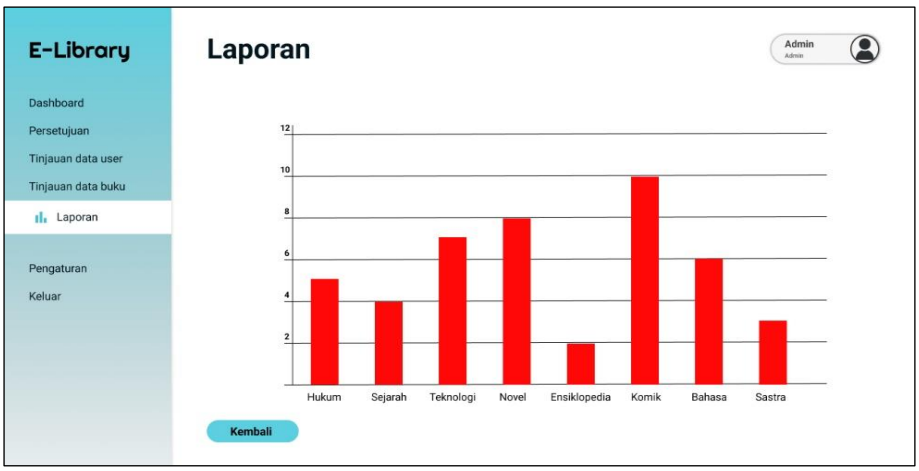

Figure 12. Book Borrowing Report Display.

Figure 12 displays the book borrowing report, which allows the creation of monthly book borrowing reports. The purpose is to identify which books are most popular among library visitors. This feature assists librarians in analyzing visitors' reading preferences and can serve as a guide in managing the library collection.

V. Conclusion

In designing the Bangka District Regional Library Information System based on a website, this research has produced a prototype library information system that significantly enhances accessibility and efficiency in library information processing. This prototype is designed with the aim of expediting the book search process and improving book borrowing efficiency, contributing positively to the enhancement of library service quality.

To optimize the positive potential of the library information system, several practical suggestions are proposed. Firstly, in the book borrowing reporting, it is recommended to provide further details such as the most frequently borrowed books and the total number of books involved. This can provide deeper insights into user preferences and the library collection's needs. Secondly, future development of the library information system should consider adding e-book borrowing features. With the increasing trend of interest in digital literature, the addition of this feature can provide easy access and adapt the library to modern readers' preferences.

By integrating these suggestions, it is hoped that the Bangka District Regional Library Information System can continue to evolve, provide better services, and remain relevant to the changing needs of the community. The overall design of this system provides a strong foundation for enhancing library management in the digital era.

References

[1] T. Sutrisna, N. Marlina, I. Kurniawan, and D. Asri, "Sistem Informasi Perpustakaan Online Pada SMA Generus Mandiri Bogor," 2021. [Online]. Available: https://jurnal.umj.ac.id/index.php/just-it/index

[2] N. Nasrullah, T. Tawakkal, and N. Hasibuan, "Adaptasi Pustakawan dalam Menghadapi Kemajuan Teknologi Informasi di Perpustakaan Utsman bin Affan Universitas Muslim Indonesia," *Jurnal El-Pustaka*, vol. 3, no. 1, pp. 50–66, Jun. 2022, doi: 10.24042/el-pustaka.v3i1.12033.

[3] D. Puspitasari, "Sistem Informasi Perpustakaan Sekolah Berbasis Web," *Jurnal Pilar NUsa Mandiri*, vol. XII, no. 1, pp. 227–240, 2016.

[4] A. Firman, H. F. Wowor, and X. Najoan, "Sistem Informasi Perpustakaan Online Berbasis Web," 2016.

[5] C. Budihartanti, ; Tuslaela, ; Elok, and N. Aeni, "Sistem Informasi Perpustakaan Online (E-Library) Pada MTs Al Maghfiroh Pekayon," *JURNAL ILMU PENGETAHUAN DAN TEKNOLOGI KOMPUTER*, vol. 4, no. 2, pp. 245–250, 2019, [Online]. Available: www.nusamandiri.ac.id

[6] W. Harjono and Kristianus Jago Tute, "Perancangan Sistem Informasi Perpustakaan Berbasis Web Menggunakkan Metode Waterfall," *SATESI: Jurnal Sains Teknologi dan Sistem Informasi*, vol. 2, no. 1, pp. 47–51, Apr. 2022, doi: 10.54259/satesi.v2i1.773.

[7] A. Octaviani and P. Dewi, "Pengembangan Sistem Informasi Perpustakaan untuk Mengelola Data Perpustakaan," *ANUVA*, vol. 5, no. 2, pp. 213–220, 2021.

[8] A. Nurseptaji and Y. Ramdhani, "Sistem Informasi Perpustakaan dengan Implementasi Model Waterfall," 2021.