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Library Information System Using QR Code Technology at Patra Mandiri 2 Junior High School, Palembang

Rey Aprinaldo[1*], Suyanto[2]

Abstract

The library of Patra Mandiri 2 Junior High School in Palembang still employs manual data collection methods, where records such as book inventories and transactions are maintained using notebooks and paper-based systems. This approach is time-consuming and prone to human error, which negatively affects library management and service efficiency. To overcome these limitations, a computerized Library Information System (LIS) was developed by integrating QR Code (Quick Response Code) technology as the central component for data access and management. The QR Code serves as a primary key for retrieving book information, while a webcam functions as the QR Code scanner. The research was conducted at Patra Mandiri 2 Junior High School, located in the Pertamina Complex, Flamboyan Street, Sungai Gerong, Plaju District, Banyuasin Regency, South Sumatra 30763. The study applied a descriptive research method and utilized the Rapid Application Development (RAD) model for system development. The objective of this study is to build a web-based library information system that integrates QR Code technology to facilitate borrowing, returning, and reporting processes. The resulting system enables efficient, accurate, and accessible library operations for students and staff.

Keywords

Library Information System; QR Code; Patra Mandiri 2 Junior High School; Web-Based Application

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[1*] Universitas Bina Darma, Indonesia, Corresponding email: [171410006@student.binadarma.ac.id]
[2] Universitas Bina Darma, Indonesia, Corresponding email: [suyanto@binadarma.ac.id]

Introduction

The advancement of information and communication technology (ICT) has revolutionized various aspects of human activity, including education. Within educational institutions, ICT plays a crucial role in improving administrative efficiency and supporting teaching and learning processes. One area that significantly benefits from ICT implementation is library management.

A library is an organized facility that stores, manages, and provides access to collections of books and other reference materials to support learning, research, and knowledge development. With technological progress, libraries are no longer confined to physical documentation; they now rely on automated systems that streamline administrative tasks and enhance accessibility for users.

A Library Information System (LIS) is designed to assist in managing book collections, membership data, borrowing and returning transactions, and reporting. Many school libraries, however, still rely on manual systems for recording and storing information, using physical ledgers or notebooks. These manual processes are not only inefficient but also susceptible to data duplication, misplacement, and loss. Additionally, generating reports manually requires rewriting and recalculating data, which increases the risk of inaccuracy and delays.

Observations and interviews conducted at Patra Mandiri 2 Junior High School in Palembang revealed that the school's library manages a collection of 1,758 books and serves 141 students. Despite this, all administrative processes are still handled manually. Library staff must record borrowings and returns using notebooks, which is time-consuming and error-prone. Although the school has computers and internet access, they are used only for browsing and not for administrative automation.

Given that students are already accustomed to using smartphones and digital platforms, these resources could be leveraged to enhance library efficiency. To improve data accuracy, accessibility, and service speed, this study proposes the implementation of a QR Code-based library information system.

A QR Code is a two-dimensional matrix barcode capable of storing complex information and allowing fast data retrieval when scanned. By applying QR Code technology, the library can encode book and member data, enabling faster and more accurate transactions. The system will be developed using PHP, HTML, CSS, and the CodeIgniter framework, with MySQL serving as the database management system.

Thus, this study aims to design and implement a Library Information System using QR Code Technology to improve the efficiency, accuracy, and reliability of library operations at Patra Mandiri 2 Junior High School in Palembang.

Methodology

2.1 Research Method

Research methodology is a structured process used to obtain valid and reliable knowledge based on systematic analysis (Ramdhani, 2013). This study employed a descriptive research method, which involves collecting and analyzing data to describe a phenomenon based on factual conditions (Abdullah, 2015).

2.2 Data Collection Methods

Data collection in this study utilized both primary and secondary data sources.

Primary Data: Obtained directly through:Observation: Conducted at Patra Mandiri 2 Junior High School to observe and record library operations and user interactions.Interviews: Conducted with library staff to gather detailed information about book collection management, member data, and transaction handling.

Secondary Data: Obtained from supporting sources such as:Documentation: Review of administrative records, archival reports, and online documents related to library operations.Literature Study: Reference to textbooks, journals, and prior research on library systems and information management.

2.3 System Development

MethodThe system was developed using the Rapid Application Development (RAD) model, which emphasizes iterative prototyping, user feedback, and fast system delivery (Kaunang et al., 2021).

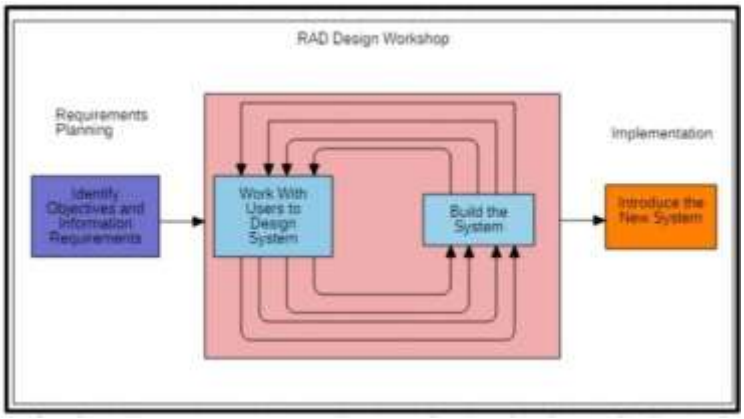

Figure 1. Rapid Application Development

The RAD process consists of three primary stages:

1. Requirement Planning: Identifying user needs and defining system objectives through discussions with library staff.
2. Workshop Design: Creating system prototypes based on user requirements, followed by refinement through user evaluation and feedback.
3. Implementation: Translating prototypes into a fully functional system through coding, integration, and final testing.

2.4 QR Code Technology

A QR Code (Quick Response Code) is a two-dimensional matrix that encodes data both horizontally and vertically. This allows it to store more information than a traditional barcode and enables high-speed data access through scanning (Cellaletin Aktas, 2017).

Types of QR Codes: Static QR Code: Contains fixed information that cannot be modified after generation. Commonly used for Wi-Fi, contact information, or URLs.Dynamic QR Code: Allows content modification after creation and is widely used in payments, document tracking, and digital systems.

Applications in Education (Agastya & Clara, 2021):Attendance tracking for students and staff.Recording borrowing and returning transactions.Verification of digital student identity.Integration in library and payment systems.

2.5 System

DesignUse Case DiagramThe system includes two main actors:

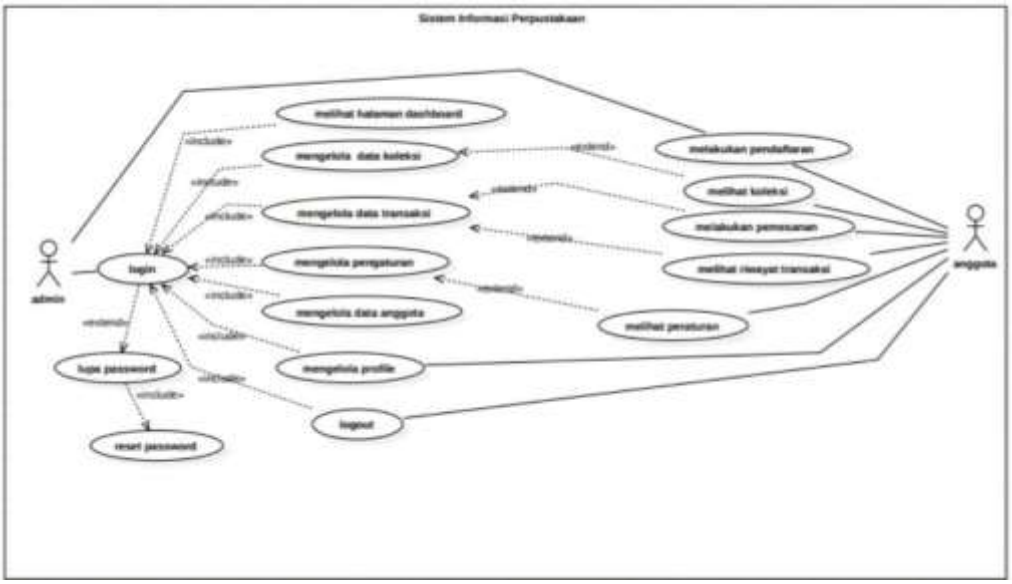

Figure 2 Use Case Diagram System

Administrator and Member.Administrator: Responsible for managing book data, member records, transactions, and reports.Member: Can search books, borrow using QR Codes, view transaction history, and access library policies.

Activity Diagram

Administrator Activity: Begins with login authentication, followed by data input, update, or deletion related to books, members, and reports.Member Activity: Involves login, searching for books, borrowing through QR Code scanning, and logout.

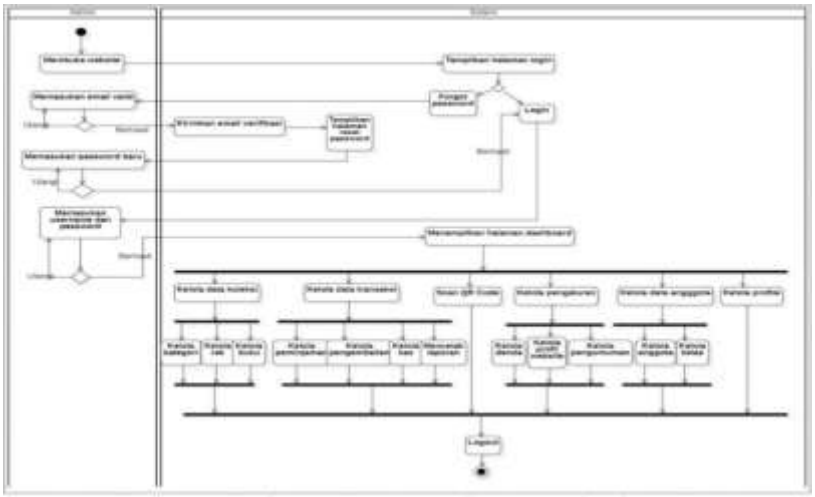

Figure 3. Admin activity diagram

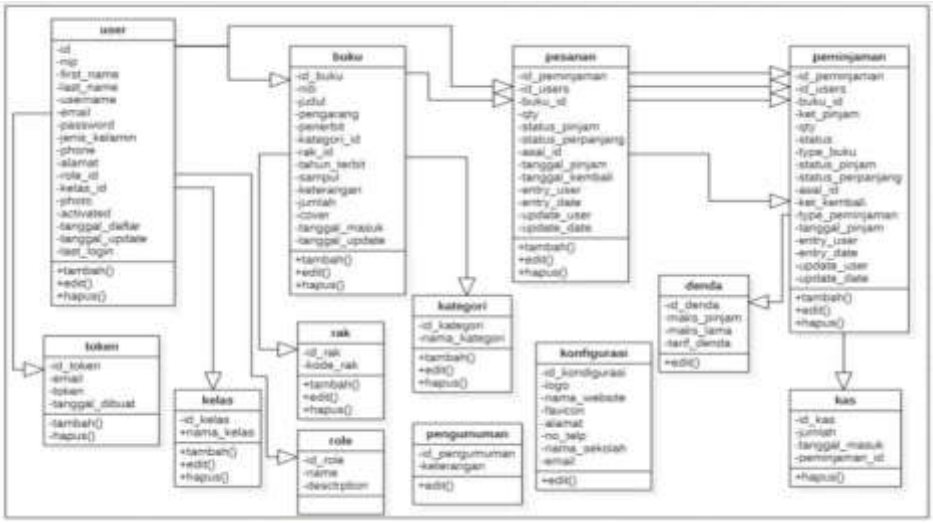

Figure 4. Class diagram of the library information system

Class Diagram, The class diagram illustrates the relationships among the core entities, including Book, Member, Transaction, QR Code, and Report, detailing their attributes and interactions.

Results and Discussion

The implementation of the Library Information System with QR Code technology enables faster and more accurate data processing. The system automates tasks that were previously performed manually, thereby minimizing human error and significantly reducing processing time.

Students can log into the web-based platform to view available books, reserve items, or review their transaction history. The librarian can generate monthly or periodic reports directly from the system without redundant data entry.

System Interface Overview

1. Login Page: The entry point for users and administrators.
2. Administrator Dashboard: Displays statistics on books, members, and transactions.
3. QR Code Scanner Page: Enables transaction processing via webcam-based QR Code scanning.
4. Book Management Page: Allows administrators to add, update, or delete book records.
5. Member Dashboard: Displays available books, borrowing history, and account details.

Discussion

The developed system demonstrates that integrating QR Code technology into library management significantly improves operational efficiency and accuracy. Compared to manual data entry, the use of QR Codes minimizes errors in recording transactions and facilitates

instant data retrieval.The web-based architecture ensures that users can access the system anytime and anywhere, aligning with the increasing need for flexible digital learning environments. This innovation also supports the school's digital transformation goals, promoting ICT literacy among students and staff.

Furthermore, the integration of QR Code technology simplifies the identification and management of library materials, ensuring that every transaction borrowing, returning, and reporting is accurately recorded and easily auditable.

Conclusion and Recommendations

Based on the research and system development process, the following conclusions are drawn: The implementation of a QR Code-based Library Information System enhances transaction efficiency for borrowing and returning books.The system improves the accuracy of data management and facilitates real-time reporting. The web-based design allows users to access library resources remotely, thereby increasing usability. The system contributes to the school's mission of adopting digital technology to enhance educational services.

Disclosure Statement

The authors declare that there are no conflicts of interest concerning the research, authorship, or publication of this article.

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Biographical Notes

REY APRINALDO is a graduate of the Department of Information Systems, Faculty of Computer Science, Universitas Bina Darma. His research interests include information systems development, web-based applications, and technology integration in education.

SUYANTO is a lecturer at the Faculty of Computer Science, Universitas Bina Darma. His areas of expertise include system analysis, software engineering, and web technology applications in education and administration.