Integration of Koha Library Management System with Open-Source Tools for Customized Readers ID Card with QR Codes

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ABSTRACT

This paper explores strategies to optimize the capabilities of the Koha library management software by integrating it with additional open-source tools. A key focus is on leveraging member data from the Koha database to design and produce reader tickets or identity cards embedded with QR codes, enhancing operational efficiency and user convenience. Engaging in a descriptive methodology, the paper scrutinizes Koha's integration of TCPDF software with PHP and HTML for effective library organization and reader card customization. The results expose that the flexibility of open-source platforms like Koha significantly decreases operative costs while contributing solid features such as error-free data handling and unified functionality. Producing ID cards using TCPDF demonstrates Koha's potential to support academic institutions by automating processes conventionally dependent on outward services. However, challenges include the necessity for programming expertise and alignment precision during customization. The paper suggests the need for improved knowledge in programming in PHP, HTML, and MySQL to maximize Koha's functionality and integration. These findings underscore Koha's role in transforming libraries into efficient, user-centered spaces.

Keywords: Koha Software, PHP, TCPDF, MySQL, HTML, Academic Library, ID Cards

INTRODUCTION

In this modern scenario, Library automation transforms the traditional approaches to library operations. Library automation means applying technology to the functions and services of libraries like circulation, cataloging, reference services, and digital libraries. This procedure assists the libraries in decreasing their manpower operations and refining their competence and precision in handling the holdings and services[1]. The automation consists of different features such as web OPAC, self-checkouts, document tracking, managing resources, and guaranteeing the right and quick products and services. It also enables the management of data and assists the libraries in collecting and analyzing it, using library services to execute better decisions[2]. Integrated library management systems (ILMS) were adopted by libraries globally to encourage computerized processes, which, in turn, enable continuous access to physical and digital resources. With the progress in technology, the scope of library automation now contains a combination of digital repositories and e-resources, expanding the services that libraries can offer to their users [3].

Open-source software (OSS) has been marked as essential for libraries in providing cost-effective resolutions for numerous services. NewGenLib, Greenstone, DSpace, and Koha are considered the major OSS for automating the library. These OSSs also assist the libraries in performing functions such as institutional repositories, digital library management, and digital libraries [4]. They, too, assist in supporting advanced services with manageable budgets for the libraries. Specialized knowledge is required for installing and handling the software and is an essential benefit for library operations. A study conducted by the Indian libraries pointed out that many libraries have adopted Koha and NewGenLib, and they have become very famous for integrated library management systems (ILMS). Greenstone, E-Prints, and DSpace were used as digital library software [5]. The results of the OSS in libraries showcase that it is essential to transform library management operations and services.

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Koha is a comprehensive, open-source Integrated Library System (ILS) designed to support a wide range of library functions. Its extensive suite of modules includes cataloguing, circulation, acquisitions, serials management, and an Online Public Access Catalogue (OPAC). These modules streamline various library operations, such as creating bibliographic records, managing the check-in/check-out process, and handling acquisitions from initial order placement to item receipt[2,6]. The cataloguing module supports various metadata standards, enabling detailed and efficient bibliographic record-keeping. Koha's circulation module automates key processes like renewals and reservations while ensuring seamless patron management, including account tracking and exemplary management.

Additionally, its user-friendly OPAC allows library patrons to search collections, place holds, and manage their accounts with ease[6]. Koha's integration capabilities make it highly adaptable to different library environments. As an open-source platform, it offers libraries the flexibility to customize workflows and interfaces, ensuring it meets specific operational needs. Koha supports integration with external databases and systems, enhancing discoverability and facilitating resource sharing[7]. The tool also includes a robust reporting module, enabling libraries to generate customized reports that aid in decision-making and performance assessment. With its cost-effective, customizable nature and strong community support, Koha enhances library services by promoting efficient management of collections and providing patrons with accessible, up-to-date information[8]. Its comprehensive approach positions it as an essential tool for modern libraries looking to optimize their services and operational workflows.

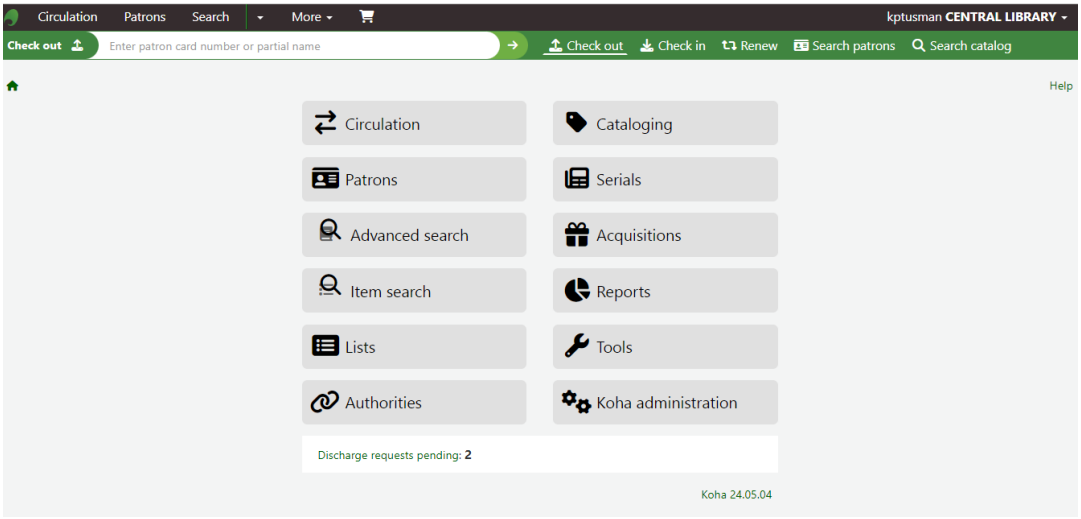

Figure - 1. Koha ILS Home page

Transition in Library Card Systems

Traditional library management systems required borrowers' cards or readers' tickets for issuing books, typically managed through card-based circulation policies like the Browney or Newarch charging systems. With the rise of information technology, libraries transitioned to automated systems supported by both proprietary and open-source software. This shift replaced the manual multi-card systems with barcode and QR code technologies, streamlining library operations.

In academic institutions, separate library cards have become outdated. Institute-issued identity cards now serve multiple purposes, including library circulation and gate entry, with barcode or QR code scanning as the standard method for transactions. The readability and functionality of these identity cards are critical for efficient library operations. Recognizing this need, many academic libraries have taken responsibility for the printing and distribution of institution identity cards. As libraries aim to ensure error-free card design and flawless barcode/QR code integration, the demand for spot-printing solutions has emerged. Such a solution would enable on-demand, precise ID card production using the existing library management system, ensuring seamless library operations and user convenience.

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The College of Engineering Thalassery has implemented a highly efficient system for generating identity cards with barcodes and QR codes, integrating them seamlessly into campus activities, including the library charging system. This innovation addresses the previously time-consuming process of creating customized ID cards with accurate data.

The library, automated with Koha Integrated Library System (ILS), incorporates this ID card generation technology using a customized TCPDF package developed in PHP. The system operates as a module within Koha, ensuring smooth integration and functionality.

The implementation of the new ID card generation system at the College of Engineering Thalassery has brought significant benefits to campus operations. The system ensures quick and error-free library transactions through barcode and QR code scanning, minimizing manual intervention in ID card-related tasks. It also introduces advanced functionality, such as integrated card scanning for gate registration and the spot printing and issuance of standardized ID cards. Operationally, the system reduces the manpower required for managing readers' tickets while seamlessly integrating with the library management system. This method has proven highly successful, streamlining processes and enhancing the user experience across the campus. It stands as a model for other institutions seeking to improve their library management and overall campus systems.

PHP and Koha

PHP, also known as Hypertext Preprocessor, is an open-source scripting language globally used for creating and developing web-active content that networks with databases. It assists server-side scripting and making up web-based applications that are needed for real-time and interactive data operations[9]. It supports Koha's expansion and functionality. For setting up the Koha software, SQL and Peral are used, and it primarily depends on PHP for several secondary functionalities, like data processing and user interface customization, in a mixture of external web requests [10]. This incorporation of PHP with Koha improves Koha's dynamic module and allows the growth of web interfaces that are accountable for and network with real-time data. It assists the Koha software in holding Koha and handling multi-layered responsibilities such as user authentication, session management, and messages with external services[11]. The PHP also permits data handling within Koha, mainly in processing user and circulation data for reporting purposes, and the libraries can generate several reports like gate entries, user activity, issues, catalogue usage, due clearance, and returns [4,11]. These facilities offer the libraries valued perceptions that can lead to resource distribution and decision-making.

Integration of TCPDF with Koha

TCPDF is a PHP-based open-source library intended exactly to create PDF files directly from PHP code without requiring external libraries or plugins. It is known for its flexibility and versatility. It assists in developing and enables developers to generate compound PDF documents from numerous data sources, inserting images, text, tables, and other visual elements effortlessly. TCPDF is outstanding for its PDF generation libraries in PHP development, and it supports Unicode, various barcode formats, and RTL languages, making it highly flexible to varied user needs. Library management systems like Koha, which often need printable documents, cataloging information, receipts, and reports, are invaluable because they contribute a reliable means of document generation directly from the system. This integration boosts Koha's functionality, giving libraries a suitable, dependable, and qualified way to handle documents and manage data output[1,2.] It also enables the libraries to offer unified labeling across all user communications, confirming steady and high-quality service.

Steps in Generating ID Cards

Card Template Design

Template design plays a crucial role in the production of ID cards. A pre-designed template, created using software like Photoshop, is uploaded to the server. This template includes fixed information such as the institute name, library name, institute address, and other static details, serving as the card's background. Member data retrieved from the Koha database is then dynamically placed in designated areas on the template. The final output is generated as a PDF, ready for printing.

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New Link

A new feature, 'Print ID Cards,' was added to the Koha report page to streamline the ID card generation process as in figure- 2. This feature is implemented as a clickable link, directing to a newly designed HTML page specifically for ID card purposes. The page allows users to select the member category and specify the range of member details for ID card generation. The following line of code was used to integrate the 'Print ID Cards' link into the Koha report page:

Print ID Cards

This addition enhances accessibility and simplifies the ID card generation workflow.

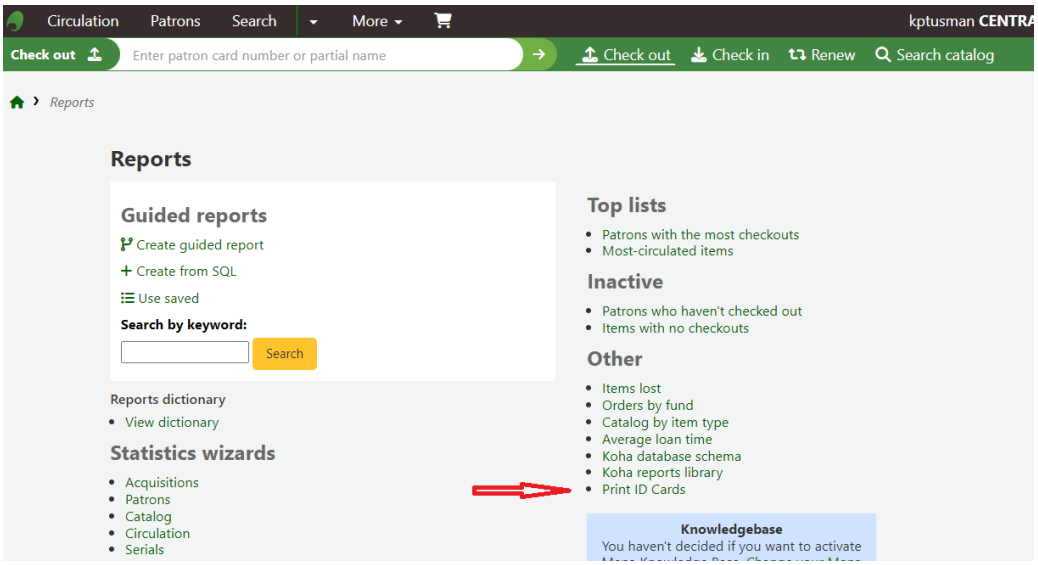

Figure -2 Koha report page

New Page

The HTML page provides functionality for generating ID cards by entering a specific card number or a range of card numbers to define the members for whom ID cards need to be generated. Selecting the member category (e.g., Students or Staff), the card templates differ for students and staff as in figure- 3, making this selection process critical. Once the details are submitted, the system establishes a connection to Koha's MySQL database to retrieve member information corresponding to the selected card numbers. The retrieved data is then processed using the TCPDF class, which is used to dynamically generate the PDF output for ID cards.

The following PHP code demonstrates the database connection setup:

```
// Server credentials

$hostname = "servername";

$username = "username";

$password = "XXXXXXXXX";

$dbname = "databasename";

// Establish Connection

$conn = new mysqli($hostname, $username, $password, $dbname);

// Check connection
```

if ($conn->connect error) {die ("Connection failed: ". $conn->connect error);

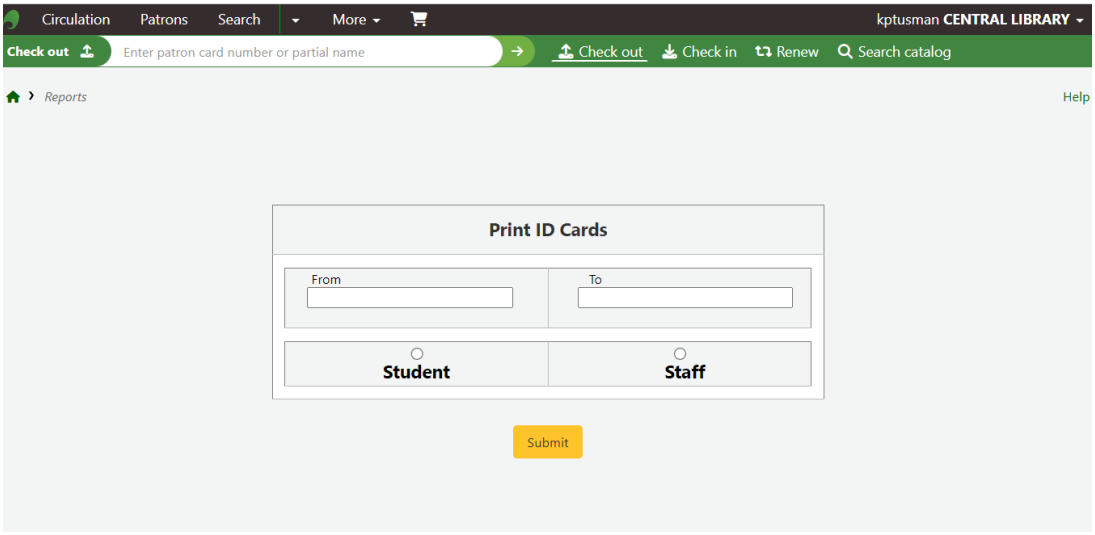

Figure -3 HTML Page designed for ID Card purpose

After establishing a connection to the MySQL database, an SQL query retrieves the required member data based on the specified card numbers and member category. This data is then dynamically formatted and incorporated into the appropriate card template using TCPDF, a powerful PHP library for generating PDF documents. The final output is a ready-to-print, category-specific PDF, ensuring a streamlined and automated ID card generation process directly from the Koha database.

SQL Query for Data Retrieval

The following SQL query is used to fetch the range of data:

$sq = "SELECT * FROM borrowers

WHERE card number BETWEEN $from AND $to

AND (category code='S' OR category code='M' OR category code='SR')

AND card number IS NOT NULL

ORDER BY card number ASC";

$result = my sqli query ($conn, $sq);

Query Breakdown:

Card number BETWEEN $from AND $to: Filters members whose card numbers fall within the specified range.

Category code IN ('S', 'M', 'SR'): Ensures the data pertains to specific member categories (e.g., Students, Staff, or Senior Members).

Card number IS NOT NULL: Ensures that only members with valid card numbers are included.

ORDER BY card number ASC: Sorts the retrieved data in ascending order by street number for orderly processing.

The query result is iterated through to extract the necessary member details, which are then inserted into predefined card templates designed for each category. Using TCPDF, a PDF file is generated with the customized

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ID cards for the specified range of members. This implementation effectively bridges the Koha database with PDF generation, offering a user-friendly and automated solution for producing professional ID cards.

Print the card

The printing of the card, where the TCPDF output generates a print-ready card in a PDF file format as in figure-4. The card template is customized in TCPDF to include all necessary details, such as the member's data and institute or library information, as per the instructions provided. This efficient system allows for the rapid production of many ID cards in minimal time, which can then be printed directly for immediate use.

Figure -4 Print ready card

Advantages

Open-Source Flexibility: Koha is an open-source software platform that can be freely customized to meet specific requirements without any additional costs.

In-House ID Card Printing: Fully automated libraries can print ID cards without relying on external agencies. ID cards are generated based on data already entered the Koha system.

Efficient and Timesaving: While the initial setup of TCPDF in Koha may take some time, ID card generation is quick and seamless once it is configured. Data is directly retrieved from the database, eliminating the need for manual data entry or proofreading.

Error-Free Data: Since the system directly uses data from the database, there are no manual errors or delays, ensuring smooth and accurate processing.

Error-Free Printing: Printing through Koha ensures error-free output, as it avoids common issues like alignment mismatches, spelling errors, or incorrect fields that can occur when outsourced to external agencies.

Multi-Purpose Card: A single card serves multiple purposes, allowing students to access library services, institutional facilities, and any other services requiring barcode or QR code scanning. This makes it highly convenient for students and institutions.

Seamless Integration: The same card can be used for library gate entry, book issue, and return processes, simplifying library operations and making them more efficient.

Streamlined Institutional Services: By using a single, multipurpose card, institutions reduce the need for multiple cards, enhancing convenience for students and aligning with user-friendly practices.

Enhanced Library Role: Libraries can support institutions by handling ID card printing, highlighting their value beyond traditional services, and contributing to overall institutional efficiency.

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Constraints

Koha Customization- Koha is a versatile platform primarily designed for public libraries. However, for academic libraries, some features and fields need to be customized based on specific requirements.

Integration of TCPDF, PHP, and HTML: The use of scripting languages such as TCPDF, PHP, and HTML is essential in Koha. For instance, TCPDF is specifically used to design and generate ID cards.

Programming Expertise: A strong understanding of programming is necessary to effectively configure TCPDF, PHP, HTML, and the MySQL database.

ID Card Alignment: Setting the alignment of ID cards is a critical aspect of the process. This often involves a trial-and-error approach, requiring adjustments multiple times to achieve precise alignment. This can be a time-intensive task.

Command and Code Accuracy: Proficiency in applying the correct commands and codes at the appropriate points is vital for successful customization and functionality.

CONCLUSION

The adoption and customization of the Koha Integrated Library System (ILS) illustrate the transformative potential of open-source platforms in modern library management. By integrating tools such as PHP and TCPDF, libraries can streamline operations, automate processes, and enhance the user experience, particularly in academic and institutional settings. This study highlights the advantages of Koha's flexibility, cost-effectiveness, and robust functionality, which collectively empower libraries to meet evolving user demands efficiently. One notable application explored in this study is the integration of TCPDF for ID card generation, a feature that demonstrates Koha's versatility and adaptability. By allowing libraries to customize ID cards personalized to precise institutional requirements, Koha removes support from outside vendors, thereby reducing costs and confirming data precision. Furthermore, the multipurpose nature of these ID cards, supporting institutional facilities, library access, and other purposes, underlines their realism and user-friendliness. However, executing such customizations is not without challenges. The findings of this study emphasize the pivotal role of open-source software in redefining library operations. Koha's adaptability allows for seamless integration with other tools and systems, facilitating advanced features such as real-time data management and reporting. These capabilities position libraries as dynamic hubs of information and innovation, capable of responding to the needs of modern users. In conclusion, Koha exemplifies how libraries can embrace technology to enhance their services, optimize workflows, and remain relevant in a rapidly evolving digital landscape. By addressing implementation challenges through targeted training and resource allocation, libraries can maximize the benefits of Koha, ensuring that they remain vital contributors to institutional efficiency and user satisfaction. This study reaffirms the transformative potential of open-source library systems in shaping the future of library management.

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