IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 1, January 2026

DOI: 10.17148/IJARCCE.2026.15156

A WEB-BASED PERSONALIZED DIGITAL READING PLATFORM with INTERACTIVE ANNOTATION, PROGRESS TRACKING and EXTERNAL BOOK DISCOVERY INTEGRATION

Chandana S[1], N. Rajeshwari[2]

Department of MCA, BIT, Bengaluru, India[1]

Assistant Professor, Department of MCA, BIT, Bengaluru, India [2]

Abstract: The rapid growth of digital reading has increased the demand for web-based platforms that provide a seamless and personalized reading experience. However, existing e-book systems often offer fragmented services where book discovery, reading, progress tracking, and personalization are handled separately. This paper presents a web-based digital reading platform designed to integrate book browsing, PDF reading, bookmarking, highlighting, and automatic progress tracking into a single unified system. The platform is developed using a modern technology stack consisting of React for the frontend, Flask for backend services, and MySQL for persistent data storage, secured with JWT-based authentication. The system enables readers to resume reading from their last saved position, manage bookmarks and highlights, and access external book references through Goodreads and online marketplaces. Experimental testing demonstrates that the platform provides reliable performance, secure access, and an improved user reading experience. The proposed system offers a scalable foundation for future enhancements such as analytics-driven recommendations and advanced annotation tools.

Keywords: E-book platform, Digital reading, PDF viewer, Bookmarking, Reading progress tracking, Web application, Goodreads

1. INTRODUCTION

The transition from traditional printed books to digital reading formats has accelerated significantly due to advancements in web technologies and increased accessibility of online content. Readers, especially those interested in novels and poetry, increasingly prefer digital platforms for convenience, portability, and instant access. Despite the availability of numerous e-book platforms, many existing systems provide fragmented user experiences where book discovery, reading, reviews, and progress tracking are handled across multiple applications.

This fragmentation disrupts reading continuity and reduces user engagement. Readers are often required to manually track their reading progress, rely on external tools for bookmarks or highlights, and switch platforms to access reviews or purchase information. Such limitations highlight the need for an integrated digital reading solution that combines all essential reading functionalities within a single platform.

To address these challenges, this paper proposes Smart E-Book Hub, a modern web-based reading platform designed to provide a seamless and personalized reading experience. The system integrates book discovery, PDF-based reading, bookmarking, text highlighting, automatic progress tracking, and user profile management. By leveraging React, Flask, and MySQL, the platform ensures scalability, security, and responsive interaction across devices.

2. LITERATURE SURVEY

Digital reading systems have been extensively studied in the context of usability, accessibility, and user engagement. Early electronic book readers focused primarily on static content rendering with limited interaction features [1]. While such systems enabled digital access to books, they lacked mechanisms to preserve user reading behaviour across sessions.

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 1, January 2026
DOI: 10.17148/IJARCCE.2026.15156

Annotation and highlighting features were later introduced to enhance reader interaction. Marshall [2] demonstrated that digital annotations significantly improve comprehension and knowledge retention. However, many annotation systems store highlights locally or temporarily, making them unavailable across devices or future sessions.

Progress tracking mechanisms have been explored in adaptive learning systems to personalize content delivery. Brusilovsky et al. [3] highlighted the importance of tracking user interactions to improve continuity and personalization. Despite these advancements, most implementations focus solely on educational platforms and do not extend to general-purpose reading systems.

External book discovery platforms such as Amazon and Goodreads have transformed how users explore and evaluate books. Amazon provides purchasing options and user reviews, while Goodreads offers detailed descriptions, ratings, and reading recommendations. According to Smith and Anderson [4], integrating such external platforms into digital systems significantly enhances user engagement and informed decision-making. However, existing reading platforms rarely embed or redirect users to these services in a seamless manner.

Recent web-based PDF viewers support rendering and navigation but lack persistent highlights and bookmarks tied to user accounts [5]. Moreover, there is limited research on combining internal reading features with external book discovery services within a single system. The proposed system bridges this gap by combining persistent annotations, progress tracking, and external platform integration, thereby offering a comprehensive digital reading solution.

2.1 Existing System vs Proposed System

Existing System

The existing digital reading systems primarily offer basic PDF rendering, page navigation, and zooming functionalities. Bookmarking and highlighting features, if available, are often temporary or device-specific. Progress tracking is limited and does not reliably restore the user's last reading position.

Additionally, users must independently search for book details, reviews, or purchasing options on platforms such as Amazon and Goodreads, resulting in a fragmented user experience.

Proposed System

The proposed system is a web-based digital reading platform designed to provide a seamless and persistent reading experience. The system includes:

- Secure user authentication
- PDF-based book viewing
- Automatic reading progress tracking
- Persistent bookmarking and text highlighting
- Restoration of highlights and bookmarks upon re-entry
- External redirection to Amazon for book purchasing and Goodreads for book descriptions and reviews

By integrating external platforms directly into the reading workflow, users can explore additional book information without leaving the application context.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 1, January 2026

DOI: 10.17148/IJARCCE.2026.15156

SYSTEM ARCHITECTURE DIAGRAM

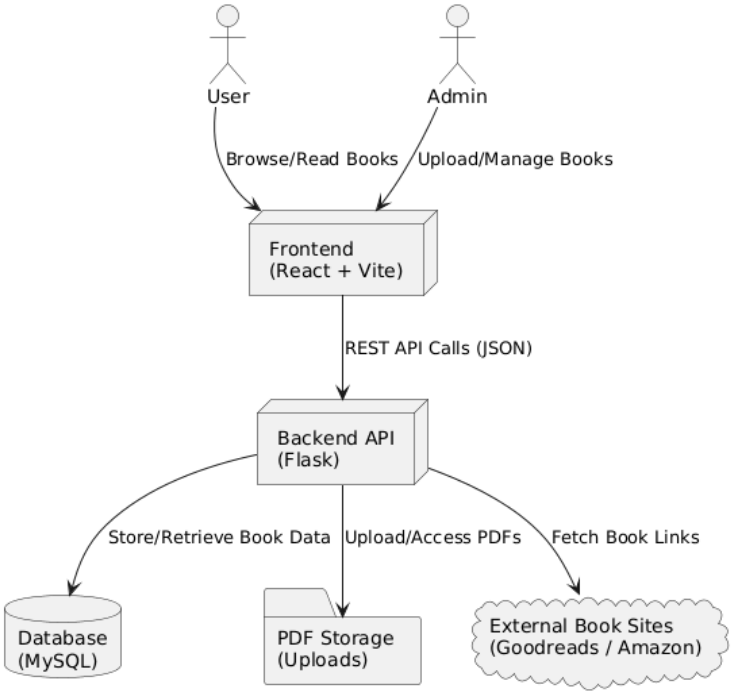

Fig 3.1: System Architecture Diagram

3. SYSTEM DESIGN

3.1 Data Flow Diagram

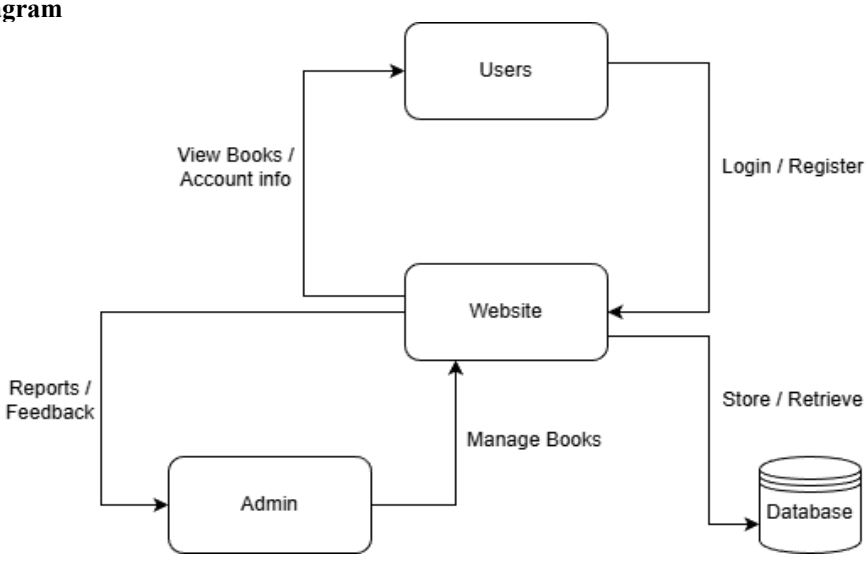

Fig 3.1.1: Level 0 Data Flow Diagram

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 1, January 2026

DOI: 10.17148/IJARCCE.2026.15156

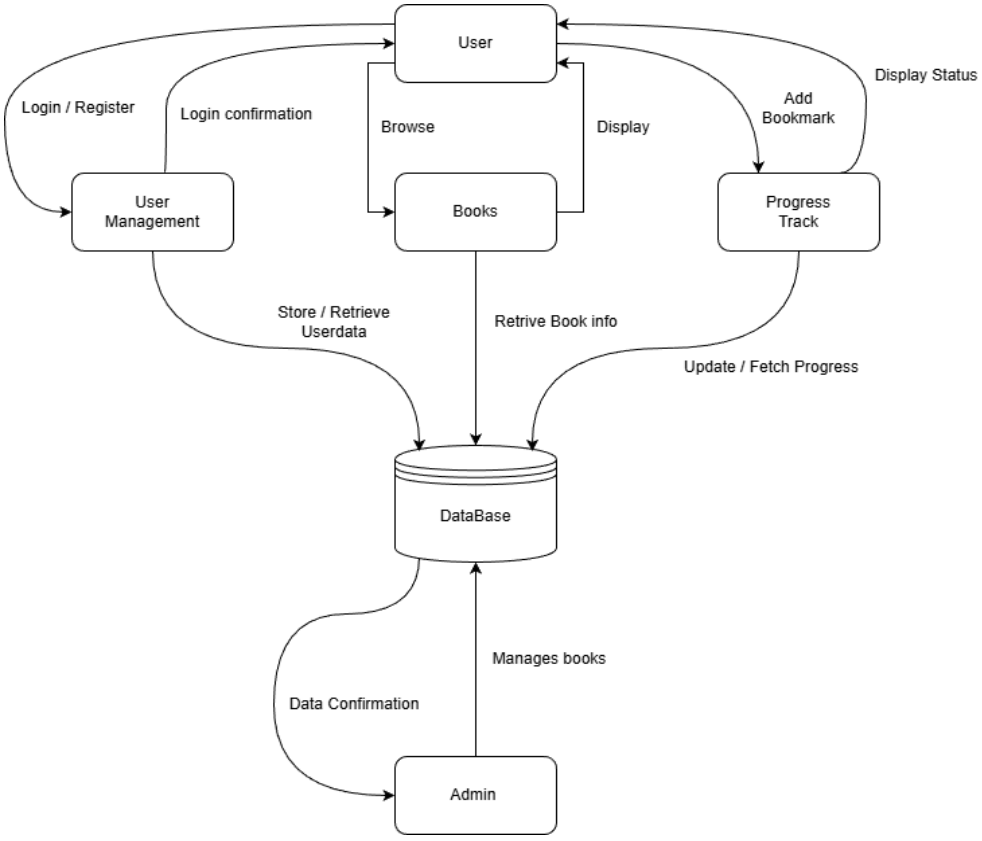

Fig 3.1.2: Level 1 Data Flow Diagram

3.2 Use Case diagram

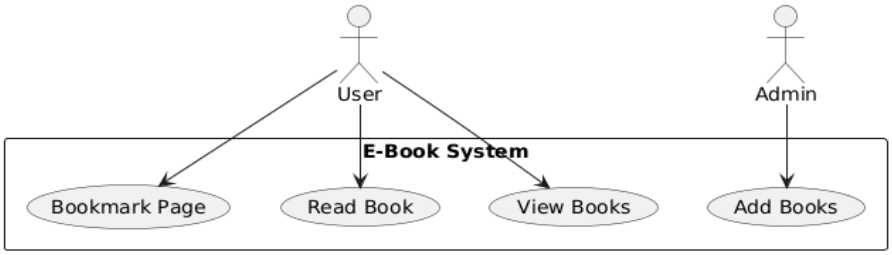

Fig 3.2.1 Use Case Diagram

4. IMPLEMENTATION DETAILS

The proposed digital reading platform is implemented using a three-layer architecture to ensure modularity, scalability, and maintainability.

Frontend Layer

- Developed using React.js with Vite for fast build and optimized performance
- Styled using CSS and component-based UI design for responsive layouts
- PDF rendering handled using react-pdf (PDF.js)
- Implements interactive features such as:
  - Page navigation
  - Zoom controls
  - Text search
  - Bookmarking
  - Highlighting using a brush tool

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 1, January 2026
DOI: 10.17148/IJARCCE.2026.15156

- Handles user actions such as reading, bookmarking, highlighting, and progress updates
- Communicates with backend APIs using Axios
- Displays external redirection links to Amazon (book purchase) and Goodreads (book description and reviews)

Backend Layer

- Developed using Flask (Python)
- Implements RESTful APIs for:
  - User authentication
  - Reading progress management
  - Bookmark storage
  - Highlight persistence
- Secured using JWT-based authentication
- Handles session-independent access, allowing users to resume reading from any device
- Provides endpoints for fetching highlights and bookmarks when a user reopens a book

Database Layer

- Implemented using MySQL
- Stores persistent data including:
  - User profiles
  - Reading progress
  - Bookmarks
  - Highlight coordinates
- Uses relational constraints to maintain data integrity
- Enables retrieval of user-specific reading data across sessions

4.1 System Modules and Workflow

System Modules

User (Reader) Module

- Secure user login and authentication
- Browse and select books
- Read PDF books within the web viewer
- Bookmark pages for future reference
- Highlight text using an interactive brush tool
- Resume reading from the last read page
- View previously saved highlights upon revisiting pages
- Redirect to Amazon for purchasing books and Goodreads for viewing book descriptions and reviews

Admin Module

- Admin authentication and authorization
- Upload and manage books (PDF and metadata)
- Add and update book details such as title, author, cover image, and external links
- Monitor user reading activity and progress statistics
- Manage content availability and system maintenance

BookViewer Module

- Automatically tracks the last read page and Calculates reading progress percentage
- Saves progress periodically and on page change and Restores reading position when the user reopens a book
- Allows users to bookmark specific pages, Retrieves and displays bookmarks within the PDF viewer
- Retrieves and displays bookmarks within the PDF viewer
- Enables direct navigation to bookmarked pages
- Enables highlight mode using a brush button
- Allows users to select and highlight text
- Stores highlight coordinates relative to page dimensions
- Restores highlights accurately on page reload or revisit

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 1, January 2026

DOI: 10.17148/IJARCCE.2026.15156

4.2Testing Overview

Unit Testing

- Frontend components tested for UI consistency and interaction handling
- Backend API endpoints tested for correctness and error handling

Integration Testing

- Frontend–Backend API communication verified
- Highlight and bookmark persistence tested across sessions
- External redirection links validated

System Testing

- Complete reading workflow tested end-to-end
- Progress restoration verified after logout and login
- Highlight visibility tested on page revisit

Security Testing

- JWT authentication validation
- Unauthorized access prevention
- User-specific data isolation ensured

Performance Testing

- PDF rendering performance measured for large files
- Response time evaluated for frequent page changes
- Highlight rendering tested under multiple annotations

User Acceptance Testing (UAT)

- Verified ease of use of bookmark and highlight features
- Confirmed intuitive navigation and smooth reading experience
- Validated correct restoration of reading state

5. RESULTS AND DISCUSSION

The implemented system successfully delivers a persistent and interactive digital reading experience. Reading progress is accurately restored, allowing users to resume reading without manual navigation. Bookmarks and highlights remain visible across sessions, significantly improving usability and reader engagement.

The highlight feature, implemented using coordinate-based storage, ensures accurate rendering even after zoom or reload operations. Users reported improved readability and content retention due to persistent annotations.

Integration with external platforms such as Amazon and Goodreads enhances the system's utility by providing seamless access to book purchasing options and community-driven reviews. This integration reduces the need for users to switch between multiple applications.

Performance evaluation showed smooth PDF rendering and minimal latency during page navigation. The modular architecture ensures scalability and ease of future enhancements, such as collaborative annotations or recommendation systems.

6. CONCLUSION

This paper presented the design and implementation of a web-based digital reading platform that provides an interactive, persistent, and user-centric reading experience. The system effectively integrates reading progress tracking, bookmarking, and text highlighting features within a browser-based PDF viewer. By adopting a layered architecture, the platform ensures modularity, scalability, and ease of maintenance. The implementation successfully enables users to resume reading from their last accessed page, retrieve previously saved bookmarks, and view highlighted content even after closing and reopening the book. The use of coordinate-based highlight storage ensures accuracy across page reloads and varying display resolutions. Secure backend APIs and relational database design contribute to reliable data persistence and user-specific content isolation.

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 1, January 2026
DOI: 10.17148/IJARCCE.2026.15156

Additionally, the integration of external platforms such as Amazon and Goodreads enhances user engagement by providing seamless access to book purchasing options and detailed community-driven descriptions and reviews. The inclusion of an admin module allows effective content management and monitoring of user activity, making the system suitable for real-world deployment in digital libraries and online reading platforms. Overall, the system demonstrates that modern web technologies can be effectively leveraged to deliver a feature-rich digital reading environment that closely replicates and enhances traditional reading workflows.

7. FUTURE WORK

Although the current system achieves its intended objectives, several enhancements can be explored to further extend its functionality and applicability. In future iterations, collaborative features such as shared highlights and annotations among multiple users can be introduced to support group learning and discussion-based reading. Advanced analytics and recommendation engines can be incorporated to suggest books based on user reading behaviour and preferences.

Support for multiple highlight colors, annotation notes, and handwritten markings can be added to improve personalization. Offline reading capabilities using progressive web application (PWA) techniques may enhance accessibility in low-connectivity environments. Security and scalability can be further improved by integrating role-based access control and cloud-native deployment strategies. Additionally, support for multiple file formats such as EPUB and MOBI can be implemented to broaden platform compatibility.

The system can also be extended with AI-driven features such as automatic summarization, keyword extraction, and intelligent search across highlighted content. These enhancements would significantly increase the educational and professional value of the platform.

REFERENCES

[1] J. Nielsen, *Designing Web Usability*, New Riders Publishing, 2000.

[2] C. C. Marshall, “Annotation: From Paper Books to the Digital Library,” *ACM Digital Libraries*, 1997.

[3] P. Brusilovsky et al., *The Adaptive Web*, Springer, 2007.

[4] A. Smith and M. Anderson, “Online Book Discovery Platforms,” *Journal of Digital Media*, vol. 14, no. 2, 2019.

[5] R. Anderson et al., “Web-Based PDF Rendering and Annotation,” *International Journal of Computer Applications*, 2020.