

***Major Project Report***  
*On*  
***LIBRARY MANAGEMENT SYSTEM***



**CHANDIGARH  
UNIVERSITY**  
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Submitted

By

**RAJAN KUMAR (O23MCA110001)**

**Subject Code-23ONMCR-753**

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In partial fulfillment of requirements for the 4<sup>th</sup> Sem Major Project in  
**MASTER OF COMPUTER APPLICATIONS**  
(2025)

Under the Project Guidance  
of

**Prof. ....**

## PROJECT REVIEW CERTIFICATE

This is to certify that the work recorded in this project report entitled "**Library Management System**" has been jointly carried out by **RAJAN KUMAR (O23MCA110001)** of the Master Of Computer Application in partial fulfillment meant of the requirements for the Final Sem Major Project in Bachelor of Computer Science and Engineering. This report has been duly reviewed by the undersigned and recommended for final submission for Major Project Viva Examination.

.....  
Prof. ....  
Assistant Prof . , Dept of MCA  
(Supervisor)

## **CERTIFICATE OF ACCEPTANCE**

This is to certify that the below mentioned student of Computer Science and has worked under the supervision of **Prof. . . . . .**, **Assistant Professor, MCA Department (Internal Guide)** on the project entitled "**Library Management System**".

The project is hereby accepted by Department of Master of Computer Science in partial fulfilment of the requirements fo 4<sup>th</sup> Sem Minor Project in Bachelor of Technology in Computer Science.

University Registration No	Name of Students	Project Venue
O23MCA110001	RAJAN KUMAR	MCA(cloud computing)

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**Signature of HoD**

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**Signature of Internal Examiner**

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**Signature of External Examiner**

## **DECLARATION**

I, the undersigned hereby declare that the work recorded in this project report entitled "**Library Management System**" in partial fulfillment for the requirements of Major Project in MCA from CHANDIGARH UNIVERSITY. Is a faithful and bonafide project work carried out at Computer Science, **Chandigarh University**.

The results of this investigation reported in this project have so far not been reported for any other Degree of any other technical forum.

The assistance and help received during the course of the investigation have been duly acknowledged.

.....  
Rajan Kumar

(o23mca110001)

.....

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**RAJAN KUMAR**  
**(O23MCA110001)**

## **DOCUMENT CONTROL SHEET**

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# LIBRARY MANAGEMENT SYSTEM

## 1. Introduction:

The library management deals in management of records. The records include books which are required by different students accordingly. Maintaining these records manually becomes difficult thus we are proving such system a computerized backend.

In this system each member is provided with a member code and all the records are maintained in a table along with the member's code. Any information can be accessed according to member-code anytime from the table and also at the time of issuing books.

## The Automated System Have Following Benefits Over Manual System

- **Data handling:** It captures the information from different sources, presents it systematically and organizes its storage for efficient retrieval.
- **Quality control:** Paper work would totally be eliminated in the new system as failure data is directly fed into system.
- **System reliability:** System is very reliable as no skipping, missing of data is possible.
- **Maintenance:** No data mismatching is possible due to various checks incorporated in the system.
- **Accuracy:** The data provided by the system will be accurate as all Processing steps are algorithmic and computer based.
- **Centralized Storage:** The data is Processed and stored at central location.
- **Security:** The data is processed and stored using .net framework based application. Hence all the security features related to .net framework are used.

## SAILENT FEATURES OF NEW PROJECT

Integrated approach to the package helps in minimizing manual approach.

- User friendly package.
- Projecthelpline.in
- Timing and retrieval efficiency.
- In-built validation checks to ensure accuracy.
- Elimination of paper work.
- Suitable help/error message for better user interface.
- Updated information.

## **2.OBJECTIVE**

- **Automation of Library Operations:** To reduce manual workload and minimize errors.
- **Improved Accessibility:** To provide users with easy access to library resources via an online platform.
- **Enhanced Resource Management:** To optimize the management of library materials, including acquisition, cataloging, and circulation.
- **User Satisfaction:** To improve the overall user experience through streamlined processes and intuitive interfaces.
- **Data-Driven Decisions:** To offer analytical tools for better decision-making and resource allocation.

With the growing information technology industry, automation of their system and management is desired by all kind of commercial enterprises. As the name suggest **Library Management System** will deal in the entire requirement needed for managing the activities of College Library. It will deal with the process of maintaining data about the books and many other things as well as transactions which are taking place in the library with respect to the Issue, Cataloguing, Searching and Return of the books.

Library Management System maintains the record of books in the library, issue, purchasing and return process of the books in the library. Here we are primarily concerned with management of books of library. In this project we identify the need for computer based Library Management Systems.

Hence this covers the following issues:

- Maintains data about the books of the library.
- Arranging data in logical order for easy maintenance.
- Collection of data about books which are issued and requirement for purchasing.
- To provide various search options to know the availability of books in the Library.
- Data about books which are lost.
- Generation of various reports according to the management request i.e. Cataloguing, Searching etc.

Library is a growing organism that requires constant positive changes to meet the need of its user. The invention of computer has brought in a rapid change in the society. Therefore, automation has become the need of the hour. Library automation not only improves the image of the library staff but also provides additional services to the users with the existing staff. The impact of automation on the library is quite obvious; it creates new environment where each function redefines the traditional organizational structure and transforms it into new institutional entries. In this unit a brief overview is given about library automation.

Automation is defined as a technique, a process, or a system which operates automatically.

According to the Encyclopedia of Library and Information Science, "Automation is the technology concerned with a design and development of the process and systems that minimize the necessity of human intervention in their operation.

Swihart Stanley S and Hefley Beryl F have defined the term 'library automation' as "the processing of certain routine clerical function in the library with the assistance of computer or other mechanized or semi automatic equipment". It may also be defined as a process of mechanization of all the housekeeping operation of a library which is repetitive in nature. The housekeeping operation includes acquisition, cataloguing, circulation, serial control, references and administration work. Automation is a technique to make a system automated, i.e. self active. For this the electronic machines are used to automate the libraries. By automation, libraries activities such as acquisition, circulation, serial control, information retrieval, cataloguing and indexing can be mechanized by using library software's.

#### **The Library Automation means:-**

- Computerization of the entire house keeping operation of the library.
- Operate a computerization library management system.
- Offer new services based on the technologies and also integrate the traditional library operations in the era.

#### **Scope**

This application can be used by any Library to automate the process of manually maintaining the records related to the subject of purchasing of books, selecting and ordering items for the collection and maintaining the accounts, Creating records for material held in the collection and providing access to the catalogue-Via an Online Public Access Catalogue (OPAC)

### **3.METHODOLOGY:**

- **Requirement Analysis:** Conduct surveys and interviews with librarians and users to gather requirements.
- **System Design:** Develop a detailed design document outlining system architecture, data flow, and user interfaces.
- **Development:** Use agile methodology to iteratively develop and test system components.
- **Testing:** Perform unit testing, integration testing, and user acceptance testing to ensure system reliability and usability.
- **Deployment:** Implement the system in a real-world library environment and monitor performance.

To develop the Library Management System Software, There we are decided the three Different layers-Presentation Layer, Logical Layer and Database Layer. In Presentation Layer to design the interface of the software. In Logical Layer to decide and write the program for to performing the library task execution under the decide module. In Database layer to analysis and design the database of the Module.

- Carry out web-based surveys of ILS curricula, as they relate to coverage of LMSs and related topics, and of ILS professionals, to determine their workplace needs for education in this specific area
- Invite selected respondents from to test the teaching materials being developed for the range of hosted LMSs
- Carry out a literature review of both the developing demands on LMSs in terms of the search facilities they offer and on practical methods of teaching basic interface design, and develop new teaching materials, using as testers people selected from.
- Evaluate, by means of post-test questionnaires for developers and course participants.

In this to collect the information for the exits Library System. To study about the introduction, Problem of the system. To analyze the aim of the project. To collects the actual information about the library from the original record of the organization. To decide the step of the solution of analyze problem using the decided methodology and technology of the project. To design the interface of the project using the design interface software (Visual basic 6.0). Designed interface is user-friendly.

### **Features of Library Management System:**

- Only basic knowledge of computers is required for operation of Library Management System. As it has user-friendly application interface.
- Library Management System is Customizable and User Configurable.
- An inbuilt settings module makes Library Management System flexibility to cater to diverse organizational needs

## **\*4.DATA MODELING:**

### **Book Catalog Table**

<b>Field Name</b>	<b>Type</b>	<b>Constrains</b>
Accessno	Text	Not Null
Category	Text	Primary Key
Title	Text	Not Null
Edition	Text	Not Null
Author	Text	Not Null
Publisher	Text	Not Null
Yrpublish	Text	Not Null
No_copy	Number	Not Null
Available_copy	Number	Not Null
Borrow_copy	Number	Not Null

### **Borrow Record Table**

<b>Field Name</b>	<b>Type</b>	<b>Constrains</b>
Borrowerid	Text	Primary Key
First Name	Text	Not Null
Last Name	Text	Not Null
mi	Text	Not Null
status	Text	Not Null
course	Text	Not Null
Add	Text	Not Null
contact	Number	Not Null

### Fine Table

Field Name	Type	Constraints
Member ID	Text	Not Null
FineOut	Number	Number
Pay Out	Date/Time	Not Null

### Global Variable Table

Field Name	Type	Contains
Total Issue Book	Number	Not Null
Renewal Counters	Number	Not Null
Max Fine Ball	Number	Not Null
Membership Duration	Number	Not Null
Membership Fee	Number	Not Null
Renewal Fee	Number	Not Null

### Current Borrow Table:

Field Name	Type	Constraints
Dbno	Text	Primary Key
Accessno	Text	Not Null
Category	Text	Not Null
Title	Text	Not Null
Edition	Text	Not Null
Author	Text	Not Null
Publisher	Text	Not Null
Yrpublish	Date/Time	Not Null
Borrow Date	Date/Time	Not Null
Due_date	Text	Not Null
Borrowerid	Text	Not Null

### **Requirements Table**

<b>Field Name</b>	<b>Type</b>	<b>Constrains</b>
ID	Text	Primary Key
TITLE	Number	Not Null
AUTHOR	Number	Not Null
PUBLISHER	Number	Not Null
NOOFBOOKS	Number	Not Null

### **User Table:**

<b>Field Name</b>	<b>Type</b>	<b>Constrains</b>
Username	Text	Primary
Password	Text	Not Null

### **Modules to cover the general library functions of:**

- Acquisitions—Selecting and ordering items for the collection and maintaining the accounts.
- Cataloguing—Creating records for material held in the collection.
- Providing access to the catalogue—Via an Online Public Access Catalogue (OPAC). This is an Online Computerized Catalogue through which library materials are processed and retrieved.

### **Logic Model:**

Logic models are narrative or graphical depictions of processes in real life that communicate the underlying assumptions upon which an activity is expected to lead to a specific result. Logic models illustrate a sequence of cause-and-effect relationships—a systems approach to communicate the path toward a desired result.

## **Inputs**

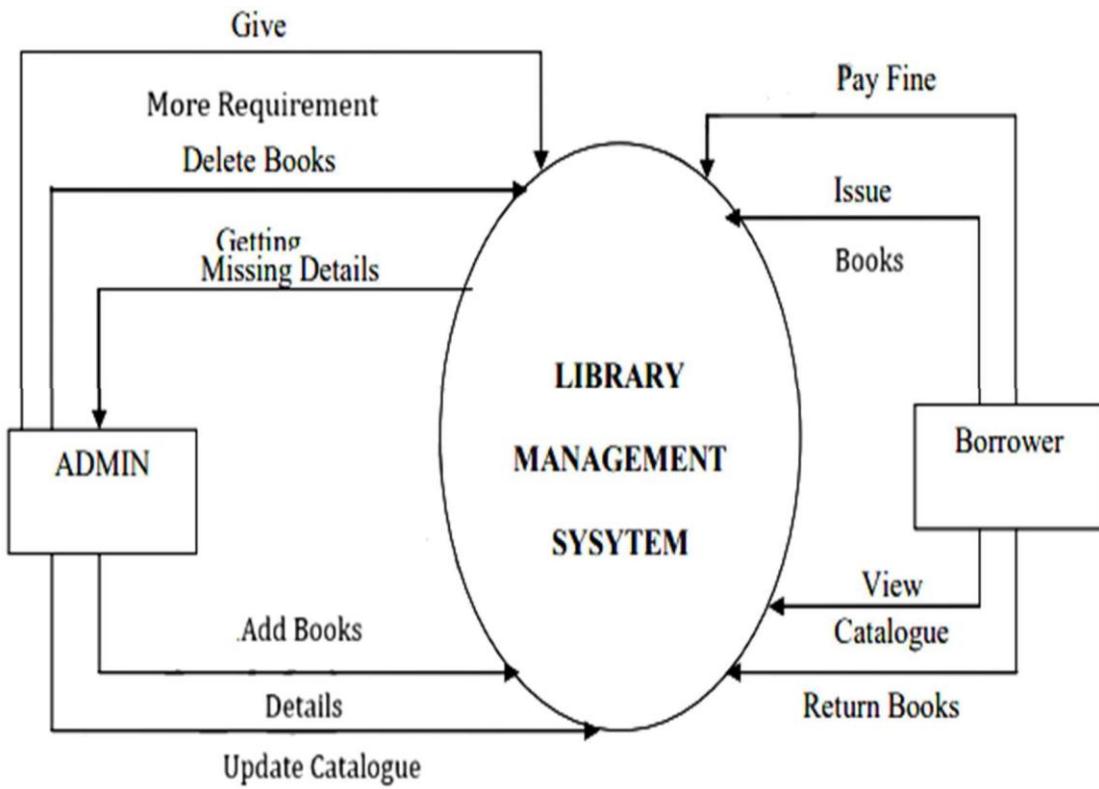
1. Library Management System for maintained the record of books to must have input data from the end user.
2. To enter the record of new books.
3. Prepare the cataloguing as input data is requirement of activity of College Library.
4. To provide various search options to know the availability of books in the Library.
5. To search the data in database.
6. To enter the cost, discount of the relative book.

## **Process Logic**

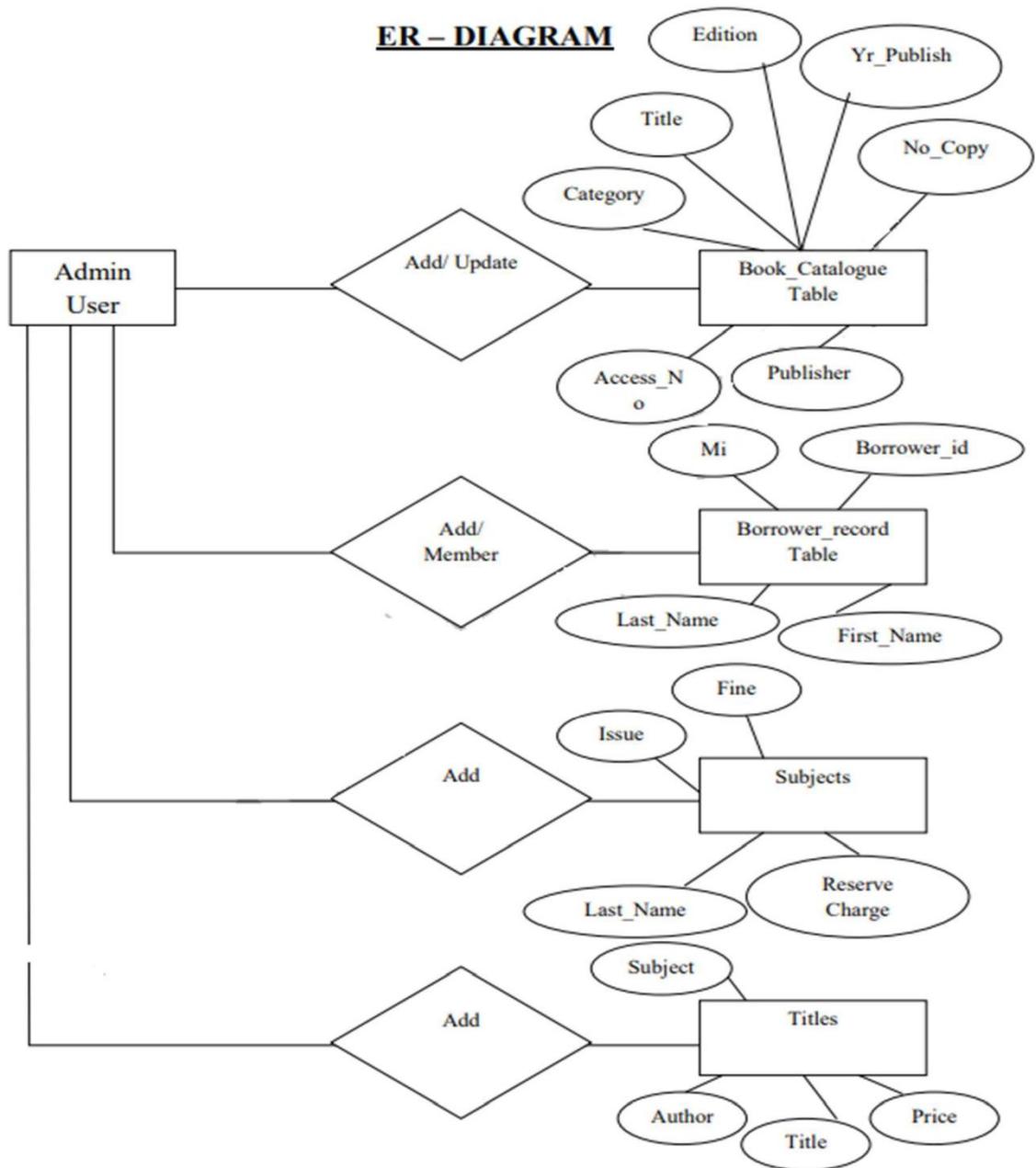
Library Management System has Perform the various type of processing. These are following:

- 1.** Selecting and ordering items for the collection and maintaining the accounts.
- 2.** Creating records for material held in the collection. 8 Projecthelpline.in
- 3.** Search the registered books and members-Via an Online Public Access Catalogue (OPAC).
- 4.** Calculate the actual cost of book.
- 5.** Report of available books. 6. To view the requirements of library.

## 5.CONTEXT LEVEL DFD



## 6.ER-DIAGRAM



## **7. Implementation Plan**

1. **Requirement Gathering:** Collect detailed requirements from stakeholders.
2. **System Design:** Create design documents and prototypes.
3. **Development Phase:**
  - **Module Development:** Develop each system module (cataloging, circulation, user management, etc.).
  - **Integration:** Integrate modules and ensure they work seamlessly together.
4. **Testing Phase:**
  - **Unit Testing:** Test individual components.
  - **Integration Testing:** Ensure modules interact correctly.
  - **User Acceptance Testing:** Validate the system with actual users.
5. **Deployment and Training:** Deploy the system and train library staff.
6. **Maintenance and Support:** Provide ongoing technical support and system updates.

## **8. Tools and Technologies:-**

- **Software:**
  - Integrated Development Environments (IDEs) like Visual Studio Code
  - Database Management Systems such as MySQL or PostgreSQL
  - Version control tools like Git
- **Programming Languages:** HTML, CSS, JavaScript,

The Library Management System (LMS) involves various layers of technology, including the frontend, backend, and database. Below are the details for each layer:

## **1. Frontend**

The frontend is the user-facing part of the LMS, responsible for providing a smooth and intuitive user experience. It includes:

- **HTML/CSS:** Used for structuring and styling web pages.
- **JavaScript:** For dynamic content and interactivity.
- **Frameworks:**
  - **React:** A JavaScript library for building user interfaces.
  - **Angular:** A platform for building mobile and desktop web applications.
  - **Vue.js:** A progressive JavaScript framework for building user interfaces.

## **2. Backend**

The backend handles the logic, database interactions, authentication, and authorization. It includes:

- **Programming Languages:**
  - **Python:** Using frameworks like Django or Flask for building robust web applications.
  - **Java:** Using Spring Boot for creating production-ready applications.
  - **Node.js:** For event-driven server-side development.
- **Frameworks:**
  - **Django/Flask:** Python-based frameworks for rapid development.
  - **Spring Boot:** Java-based framework for microservices and web applications.
  - **Express.js:** A minimal and flexible Node.js web application framework.

## **3. Database**

The database layer is responsible for storing and managing the data used by the LMS. It includes:

- **Database Management Systems (DBMS):**
  - **MySQL:** A relational database management system known for reliability and ease of use.
  - **PostgreSQL:** An advanced open-source relational database with strong SQL compliance and extensibility.
  - **MongoDB:** A NoSQL database for flexible and scalable data storage.
- **SQL:** Structured Query Language for managing and querying relational databases.
- **ORM (Object-Relational Mapping):**
  - **SQLAlchemy:** A SQL toolkit and ORM for Python.
  - **Hibernate:** A Java-based ORM framework.
  - **Mongoose:** An ODM (Object Data Modeling) library for MongoDB and Node.js.



## Integration and Communication

The layers communicate through well-defined APIs and data exchange formats:

- **RESTful APIs:** For communication between the frontend and backend.
- **GraphQL:** For efficient data querying and manipulation.
- **JSON/XML:** For data interchange formats.

## Frontend

- **HTML/CSS:** Provides the basic structure and style of the web pages.
- **JavaScript:** Adds interactivity and dynamic content.
- **React:** Used to create reusable UI components and manage the user interface.

## Backend

- **Python (Django):** Handles business logic, processes user requests, and interacts with the database.
- **RESTful API:** Exposes endpoints for frontend to interact with the backend.

## **Database**

- **PostgreSQL:** Stores user information, library resources, transactions, and other data.
- **SQLAlchemy (ORM):** Maps database tables to Python objects, simplifying database operations.

## **Example Workflow**

1. **User Interaction:** A user searches for a book using the search bar on the frontend.
2. **API Request:** The frontend sends a request to the backend through a RESTful API endpoint.
3. **Data Processing:** The backend processes the request, queries the database, and retrieves the relevant data.
4. **Response:** The backend sends the data back to the frontend in a structured format (JSON).
5. **Display:** The frontend processes the data and displays the search results to the user.

## **8. Expected Outcomes:-**

- **Operational Efficiency:** Significant reduction in manual processing and improved accuracy in cataloging and circulation.
- **User Empowerment:** Enhanced user experience with self-service options for searching, reserving, and borrowing library materials.
- **Resource Optimization:** Better management of library resources, including tracking and utilization.
- **Data Insights:** Access to detailed reports and analytics for informed decision-making.
- **Scalability:** A scalable system that can grow with the library's needs.

## **9. Timeline**

- **Week 1:** Requirement Gathering and Analysis
- **Week 2-3:** System Design and Prototyping
- **Week 4-6:** Development Phase
- **Week 7-8:** Testing Phase
- **Week 9:** Deployment and Staff Training
- **Week 10-12:** Monitoring, Maintenance, and Support

## CHAPTER8:REFERENCES

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## *Conclusion*

### 01. Summary

The Library Management System project was developed to address the challenges faced by traditional library environments, such as manual record keeping, delayed book searches, inefficient borrowing and returning processes, and lack of systematic data management. The project aimed to create a robust, user-friendly, and efficient software system that would digitize and automate the core operations of a library.

Through the systematic analysis of user requirements and existing shortcomings, a digital solution was designed and implemented using modern technologies. The system integrates multiple functional modules—user management, book management, issue/return tracking, search capabilities, and reporting—within a centralized database system. It enables library staff to efficiently handle day-to-day tasks while giving users (students, faculty, or public members) better access to the library's resources.

The development process included extensive planning, analysis, design, coding, and testing phases. Key software engineering principles were followed to ensure a modular, scalable, and secure application. The system was thoroughly tested to ensure reliability and correctness, and its deployment has demonstrated significant improvements in performance and accuracy compared to manual methods.

In conclusion, this project successfully fulfills its intended purpose of transforming a traditional library into an automated system, leading to reduced workload, faster processing times, and better data integrity.

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## 02. Project Outcomes

The outcomes of the Library Management System project are significant, both from technical and operational standpoints:

- **Improved Efficiency:** The system streamlines administrative tasks such as issuing, returning, and cataloging books, which drastically reduces the time and effort needed by library staff.
- **Enhanced User Experience:** Students and other users can quickly search for books, check availability, and even view their borrowing history, leading to a more satisfying and autonomous user experience.
- **Data Accuracy and Consistency:** Centralized data storage ensures that information is consistent across all modules, reducing the chances of errors, duplicate entries, and data loss.
- **Security and Accountability:** With user authentication and role-based access, the system secures sensitive data and ensures that only authorized personnel can perform certain actions.
- **Better Reporting and Analytics:** The built-in reporting features provide insights into book usage patterns, overdue books, and inventory management, helping library administrators make informed decisions.
- **Scalability and Maintainability:** The system is designed in a modular fashion, making it easy to add new features or scale to larger institutions if needed in the future.
- **Support for Future Enhancements:** The project lays a strong foundation for potential future upgrades, such as integration with barcode scanners, RFID systems, or mobile applications.

In summary, the Library Management System has met its design goals and delivered comprehensive, user-only meets current library needs but is also adaptable for future technological

Advancements. It serves as a valuable tool for academic institutions or public libraries aiming to modernize their operations and provide better service to their users.

## 2. System Analysis

System analysis is a crucial phase in the software development lifecycle, as it helps to understand the existing system, identify problems, and define the functional and non-functional requirements for the proposed solution. For the Library Management System project, this phase involved extensive research and consultation with potential users and stakeholders, including librarians, administrative staff, and library members. Below is a detailed breakdown of each sub-section within the system analysis:

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### 2.1 Existing System

The existing system, in many cases, is a **manual or semi-automated system** used by libraries to manage books, users, and transactions. Typically, this involves maintaining **registers or spreadsheets** to record book issuances, returns, user details, and inventory.

Some common characteristics of the current system include:

- Manual entry of data, which increases the risk of **human error**
- Difficulty in **searching or updating records**
- Time-consuming **book lending and return processes**
- No centralized access to real-time data
- Inadequate reporting and tracking capabilities
- Limited security and access control

While some libraries may use standalone digital tools, these often lack **integration** and **scalability**, which limits their effectiveness.

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## 2.2 Problem Statement

systems suffer from several key issues:

- **Inaccuracy and Inconsistency:** Manual data handling results in frequent errors, such as lost or misfiled records.
- Despite the importance of libraries in educational and public institutions, the traditional library **Inefficiency:** Staff spends a significant amount of time maintaining logs, issuing/returning books, and locating information.
- **Poor User Experience:** Users cannot quickly check book availability or manage their borrowing history.
- **Lack of Real-time Updates:** Any updates to inventory or user data are not reflected in real-time, leading to duplication or confusion.
- **Limited Security:** Without proper authentication or access controls, there is a risk of unauthorized access and data manipulation.
- **Inadequate Reporting:** Administrators lack tools for generating reports related to book usage, overdue items, or inventory levels.

These problems highlight the need for a **digital, automated solution** that enhances accuracy, speed, and overall management of library operations.

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## 2.3 Proposed System

The proposed Library Management System is a **centralized software application** designed to automate the entire lifecycle of library operations—from book acquisition to issuing and returning, tracking overdue items, and managing user accounts.

Key features of the proposed system include:

- **Digital Book Inventory Management:** Easy addition, update, and removal of book records with categorization and search capabilities.
- **User Management:** Registration, login, and role-based access for students, faculty, and administrators.
- **Issuing and Returning Books:** Automated tracking of due dates and overdue books with fine calculation features.
- **Search Functionality:** Fast and accurate searching by title, author, genre, or book ID.
- **Reports and Analytics:** Dashboard and report generation for daily transactions, user activity, and inventory status.
- **Security:** Password-protected logins and role-based permissions.
- **Backup and Recovery:** Periodic backups to prevent data loss.

The system will be developed using modern programming languages and database technologies to ensure performance, scalability, and ease of maintenance.

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## 2.4 Feasibility Study

The feasibility study assesses whether the proposed system can be realistically developed and deployed, considering technical, economic, and operational aspects.

- **Technical Feasibility:** With the availability of development tools (e.g., HTML, CSS, JAVASCRIPT, MySQL, PHP) and skilled developers, the system is technically viable.
- **Economic Feasibility:** The cost of development is low compared to the long-term savings and efficiency gains. Open-source tools further reduce costs.

- **Operational Feasibility:** The system will be user-friendly, requiring minimal training for library staff. Its intuitive design ensures smooth adoption.
- **Legal and Regulatory Feasibility:** There are no legal constraints in deploying such a system for internal library use, as long as user data is handled responsibly.

The feasibility analysis confirms that the proposed system is a **cost-effective and practical** solution for modern library needs.

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## 2.5 Requirements Analysis

To ensure the system meets user expectations, a comprehensive requirement analysis was conducted, divided into **functional** and **non-functional** requirements.

### Functional Requirements:

- User registration and login
- Add, update, delete book records
- Issue and return books with due dates
- View available books
- Generate overdue and activity reports
- Admin control for managing users and content

### Non-functional Requirements:

- Security: Only authorized users can access or modify data.
- Usability: Interface must be intuitive and responsive.
- Performance: Quick loading time for searches and transactions.
- Scalability: Should support growing numbers of users and books.
- Maintainability: Easy to update and add new features.

- Availability: Minimal downtime and 24/7 accessibility in case of a web-based system.

This analysis provides a clear foundation for the system's design and implementation phases.

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## 2.6 Software and Hardware Requirements

To develop and deploy the Library Management System, the following software and hardware resources are required:

### **Software Requirements:**

- Operating System: Windows/Linux/macOS
- Programming Languages: Java/PHP/Python or similar
- Frontend: HTML, CSS, JavaScript (if web-based)
- Backend: MySQL, PostgreSQL, or another relational database
- IDE: Visual Studio Code, Eclipse, NetBeans, etc.
- Web Server (for web-based systems): Apache or Nginx
- Browser: Chrome, Firefox, or Edge

### **Hardware Requirements:**

- Processor: Intel i3 or above
- RAM: Minimum 4 GB (8 GB recommended)
- Storage: At least 100 GB HDD or SSD
- Network: Stable internet (for cloud/web-based deployment)
- Backup Devices: External drives or cloud backup options

These requirements ensure the system runs smoothly and is accessible by both administrators and end users.

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## Conclusion of System Analysis

The system analysis phase confirms that there is a strong **need and opportunity** for digitizing library operations through a custom-built Library Management System. The insights gained from examining the existing system, identifying problems, and analyzing user requirements form the foundation for a reliable, efficient, and future-ready solution.

Thanks!