

# LIBRARY MANAGEMENT SYSTEM

Data Management & Database Design Project

## Abstract

A database project designed to manage all the in-house functions of a library.

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# LIBRARY MANAGEMENT SYSTEM

## 1. Background

Libraries are still a crucial part of the education system. In today's era of digitization, where educational institutes are also making their way towards digital adoption, why should libraries remain old-school? A library management system can help automate most of the library's manual operations like acquisition, cataloguing and classification, storage, and retrieval of information - a tiresome process for any librarian.

This project introduces a convenient, reliable, and secure way to help readers and librarians manage things with a single click. The project's database system not only streamlines the process of tracking the books owned, borrowed, member's subscriptions, and profiles but also facilitates resource management in a cost-effective and time-saving manner, thus increasing the productivity of the working staff.

Now say goodbye to the challenges of managing the libraries with a system that can transform the conventional libraries into automated systems, seamlessly making them practical and effective at the same time.

## 2. Objectives

1. Provide a database system for maintaining a catalog of books and their status, and keep track of readers or members' subscriptions, user roles, and account access details.
2. Maintaining daily reports of the total books issued, returned, due dates, fines paid, etc.
3. Provide efficient cataloguing and classification of materials thus enabling readers to easily search for the desired material in no time.
4. Manage the demand and supply of books in an effective manner by providing a real-time analysis on the availability of books and other items owned, thus saving time for all entities involved.
5. Ensure data security through authorized access to the system.
6. Reduce the risk of book loss and enables personal information security.
7. Minimize the manual effort in processes like book issuance, records maintenance, late fee collection, etc.

### 3. Scope

The Library Management System software will include the following features in its scope –

1. Inventory Management includes cataloguing and classification of library materials i.e., books, CDs, etc., addition, deletion and updation of books or other materials to the system with their details.
2. Authentication system enables the administrators to manage the system and users to access library materials.
3. An overview of daily activities can be retrieved by generating customized reports.
4. Late Fee Collection - The system should be able to collect fines for books returned after the due date.
5. Any library member should be able to search for library materials based on some specific characteristics.
6. Any reader may become a member of the library by registering themselves into the system. A library card will be issued to each member, which will have a unique Member ID.
7. The system also enables user and roles management.
8. The different rooms within the library can be reserved by its members through prior registration.

### 4. E-R Diagram

#### 4.1. Business Rules

The Library Management System project will focus on the following set of requirements –

1. A material catalog keep tracks for all the library materials and a material must either be a book or a printer. (There are no other types of materials in LMS).
2. A person must either be a Member, Librarian, or an Author. There are no other types of persons in the LMS.
3. A Librarian manages the material catalog by adding or deleting the materials from the catalog.
4. A member may borrow any number of books from the library and a book must be issued to at most one member at a given time.
5. There could be more than one copy of a book, and a member can issue at most one copy of a particular book at a given time. Each copy of a book is treated as a separate BOOK instance with a unique Book ID.
6. A member may return any number of books before their due date or will be liable to pay a fixed amount per day after the due date.
7. A maximum of 5 books can be issued at a time to any member, and the books need to be returned within or before end of two weeks from the date of issue.
8. A person may use any printer from the library, and a printer may be used by more than one person.
9. A person must be registered as a member of the library to be issued a library card.
10. A library card can be issued to at most one person, and a person must have only one library card, at a given time.
11. A member may book many rooms, and a room may be booked by multiple members.
12. A person should be able to search the material catalog for any number of books by their ID, title, author, or publication date.
13. A book must be published by at least one author and an author must publish at least one book.

## 4.2. Entities & Attributes

The Entity-Relationship diagram for the Library Management System will include the following entities and attributes –

1. **Material Catalog** is a supertype with subtypes **Book** and **Printer**. The common attributes are Material ID, Material Name, Classification, Material Status, Price, Location, Last Updated, Material Type.
2. Attributes that specifically apply to **Book** are Author, Copies (a multivalued attribute to store the number of copies), Publication Date, Edition, Rack, Section, Barcode.
3. **Printer** has Model Number, Manufacturer, Printer Type as its unique attributes.
4. **Person** is a supertype with subtypes **Librarian**, **Member**, and **Author**. The common attributes are Person ID, Name, Address, Phone, Email, Date of Birth, Person Type (which acts as the subtype discriminator).
5. The subtypes Librarian, Member, and Author are uniquely identified with their relationships with other entities as described later.
6. **Account** is an entity described for storing the registration details for every Person. It is described with attributes Account ID, Username, Password, User role, Account Status.
7. **Library Card** is an entity used to store the membership details for each Person and is described with attributes Card ID (barcode), Issued Date, Expiry Date, Fine Due, Status.
8. **Room** is used to enable private space booking for study groups or discussions. The entity is described with the attributes Room No., Capacity, Floor, and Room Type (shared, private, video conference).

