Library Management System

University of Mindanao Tagum College - Visayan Campus

A PROJECT PROPOSAL FOR PROFESSIONAL TRACK FOR IT13

PROFESSIONAL TRACK FOR IT4

SUBMITTED TO

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Table of Contents

CHAPTER 1

INTRODUCTION

Project Context

Information technology is crucial for libraries worldwide to centralize control over bibliographic records, circulation activities, and member profiles. Automated systems are essential for promoting uniform data handling and mitigating the discrepancies inherent in repetitive manual entry (Soutron, 2020). Implementing architectural standards like SOLID principles ensures systems managing long-term institutional records maintain component independence and ease of maintenance (Martin, 2003; Begum & Elahi, 2022). This structured design guarantees the proposed solution is adaptable and sustainable.

Contemporary libraries must manage diverse resources, including academic works, multimedia, and electronic publications, all requiring precise status and classification tracking (eGenius, 2024). Furthermore, automated systems are necessary for consistently enforcing borrowing rules across varied user groups (students, faculty, guests). Automating policy enforcement, a key system feature, enhances fairness and procedural reliability (ALA, 2020).

The transition to integrated library management is critical in local academic institutions where efficient information access is paramount. The absence of a unified system restricts the library's responsiveness to user needs (F.L. Vargas College, 2024). Developing a C# .NET WinForms desktop application provides a framework for stable deployment and consistent interaction with local databases, facilitating staff tasks through a streamlined interface.

The proposed Library Management System will directly strengthen the operational foundation of the University of Mindanao Tagum College Library. It provides a unified platform for circulation validation, fine handling, inventory control, and administrative reporting. This centralized data management and systematic automation ensure the library achieves efficient and verifiable service delivery.

Statement of the Problem

The University of Mindanao Tagum College Library faces significant operational challenges due to its reliance on manual and partially automated management practices, impacting efficiency and data reliability. The specific problems are:

1. **Inaccurate Circulation Monitoring:** Manual documentation leads to inconsistent records and difficulty tracking material status.
2. **Irregular Policy Enforcement:** Lack of automated validation makes consistent enforcement of varied borrowing rules and eligibility requirements across different user groups difficult.
3. **Error-Prone Fine Administration:** Manual computation of overdue charges increases administrative workload and risks inaccuracies in penalty records.
4. **Limited Inventory Control:** Manual tracking struggles to manage multiple copies, locations, and material conditions, reducing accuracy in availability reports.
5. **Constrained Search and Retrieval:** Manual or basic listing methods impede efficient, structured searching and filtering, limiting resource accessibility for users.

These issues necessitate a comprehensive Library Management System to automate core operations, ensure consistent policy enforcement and data integrity, and enhance resource access.

General Objective

To design and develop a Windows Desktop Library Management System using C# .NET WinForms that automates core library operations, supports consistent policy enforcement, and improves information organization and access for the University of Mindanao Tagum College Library.

Specific Objectives

a. Develop a secure, role-based user management component for librarians, staff, library members, and guests.

b. Create a cataloging module that supports multiple resource types with accurate status and location tracking.

c. Implement a circulation module that manages borrowing, returning, and renewal processes with built-in rule validation.

d. Develop a fine and penalty management module that handles overdue, lost, and damaged materials with proper recordkeeping.

e. Design a search and discovery interface that supports structured filtering and efficient retrieval of library resources.

f. Apply object-oriented programming concepts and SOLID principles to ensure maintainable and extensible system design.

g. Design a normalized database schema using SQL Server to support reliable data storage and retrieval.

Scope and Limitations

The project focuses on the development of a Windows Desktop Library Management System using C# .NET Framework and WinForms. The system covers user management with role-based access, member registration and status handling, cataloging of library resources, circulation processes including borrowing, returning, and renewal, fine and penalty management, inventory tracking, and search functionality. The application supports structured data management through a relational database and applies object-oriented programming and SOLID design principles to ensure organized system architecture.

The system is limited to a Windows Desktop environment and does not include web-based or mobile access. Reservation functionality is excluded from the system. The database implementation is confined to SQL Server. Payment processing is limited to recording transactions and does not involve external financial system integration. Hardware-related implementation, such as physical barcode scanner configuration, is beyond the scope of the project.

CHAPTER 2

SYSTEMS DESIGN

Prototype

This C# WinForms prototype is a desktop-based Library Management System providing full control over core library functions. It integrates User Management, comprehensive Cataloging, and a precise Circulation Module for book transactions. The system automatically enforces policy compliance via Fine & Penalty calculation and ensures accurate stock levels through Inventory Management. The included Reporting & Analytics Module delivers essential data on collection status, membership, and usage.

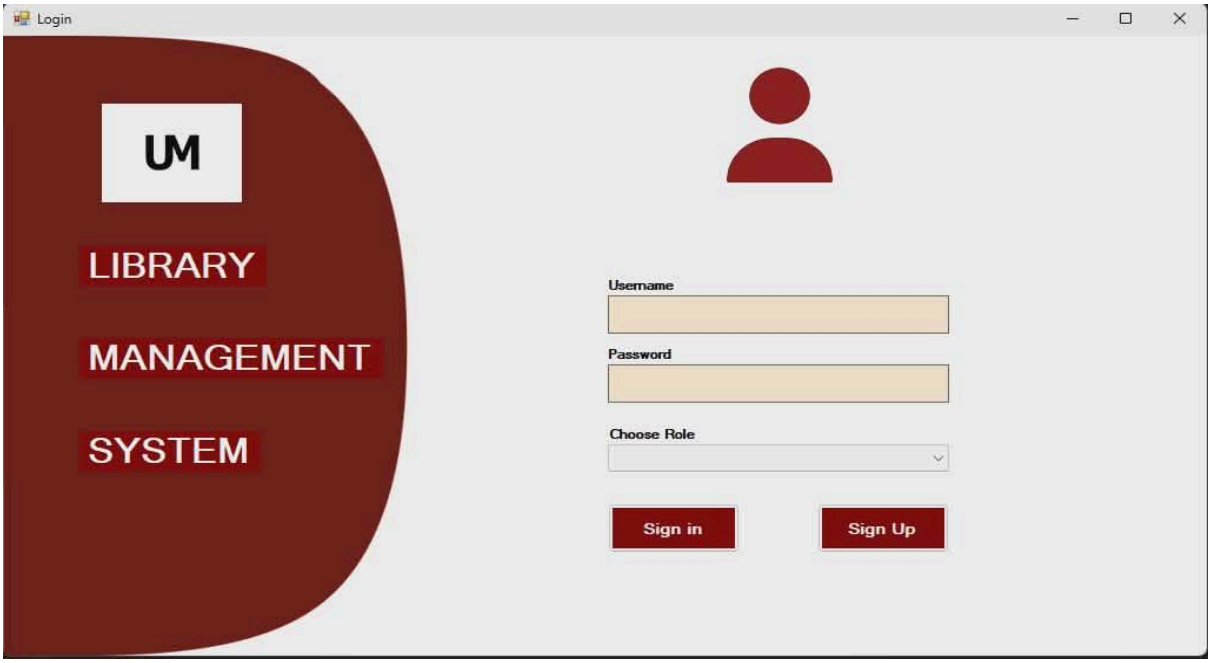

Figure 2.1 Login Page

Figure 2.1 illustrates the WinForms Login Page for the Library Management System. It presents the interface for a role-based access system, allowing different users to enter their credentials and specify their role to access the appropriate system features. This page requires users to enter their Username and Password, and then select their specific role from a dropdown menu (such as Librarian/Admin, Staff, Member, or Guest) before clicking Sign in.

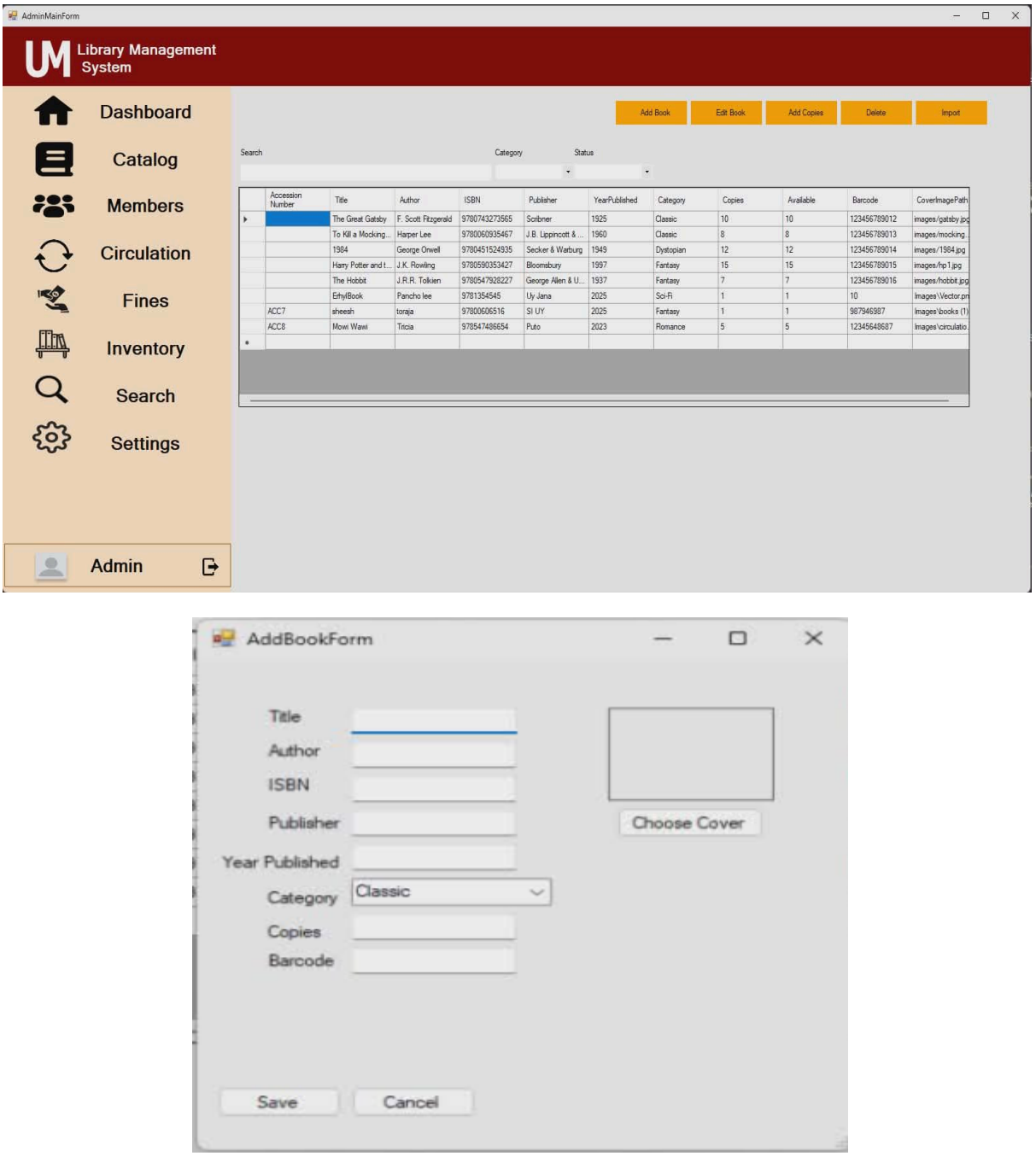

Figure 2.2 Catalog Page

Figure 2.2 displays the Catalog Page of the C# WinForms LMS, the central interface for collection management. The left panel shows the main navigation, highlighting the Catalog module. The primary area features search and filter controls, and action buttons for staff (Add Book, Edit Book, Delete, Import). The data grid lists all resources, detailing key identifiers (Accession Number, Title, ISBN), publication data, availability status (Copies, Available), and location information.

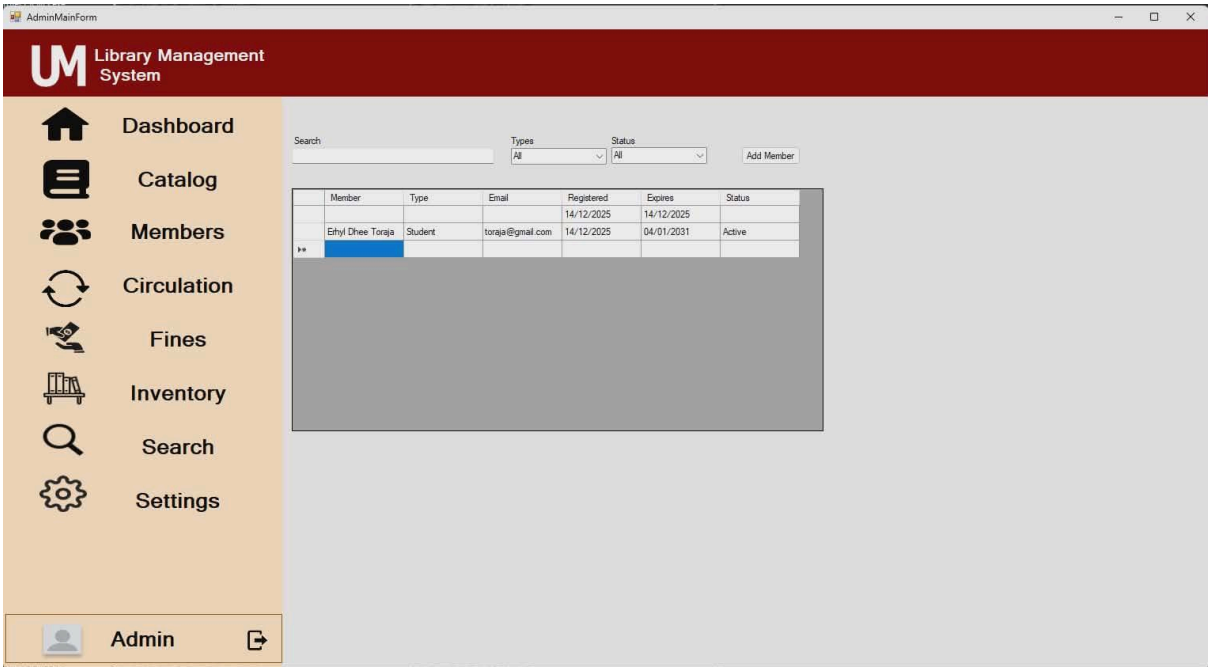

Figure 2.3 Members Page

Figure 2.3 displays the Members Page in the C# WinForms LMS, used for membership administration. The screen features a navigation panel highlighting Members. Staff can use search and filters for Type and Status, and an Add Member button for registration. The central data grid lists members by Name, Type, Email, Registration/Expiration Dates, and Status, providing essential oversight of the user base.

UML Class Diagram

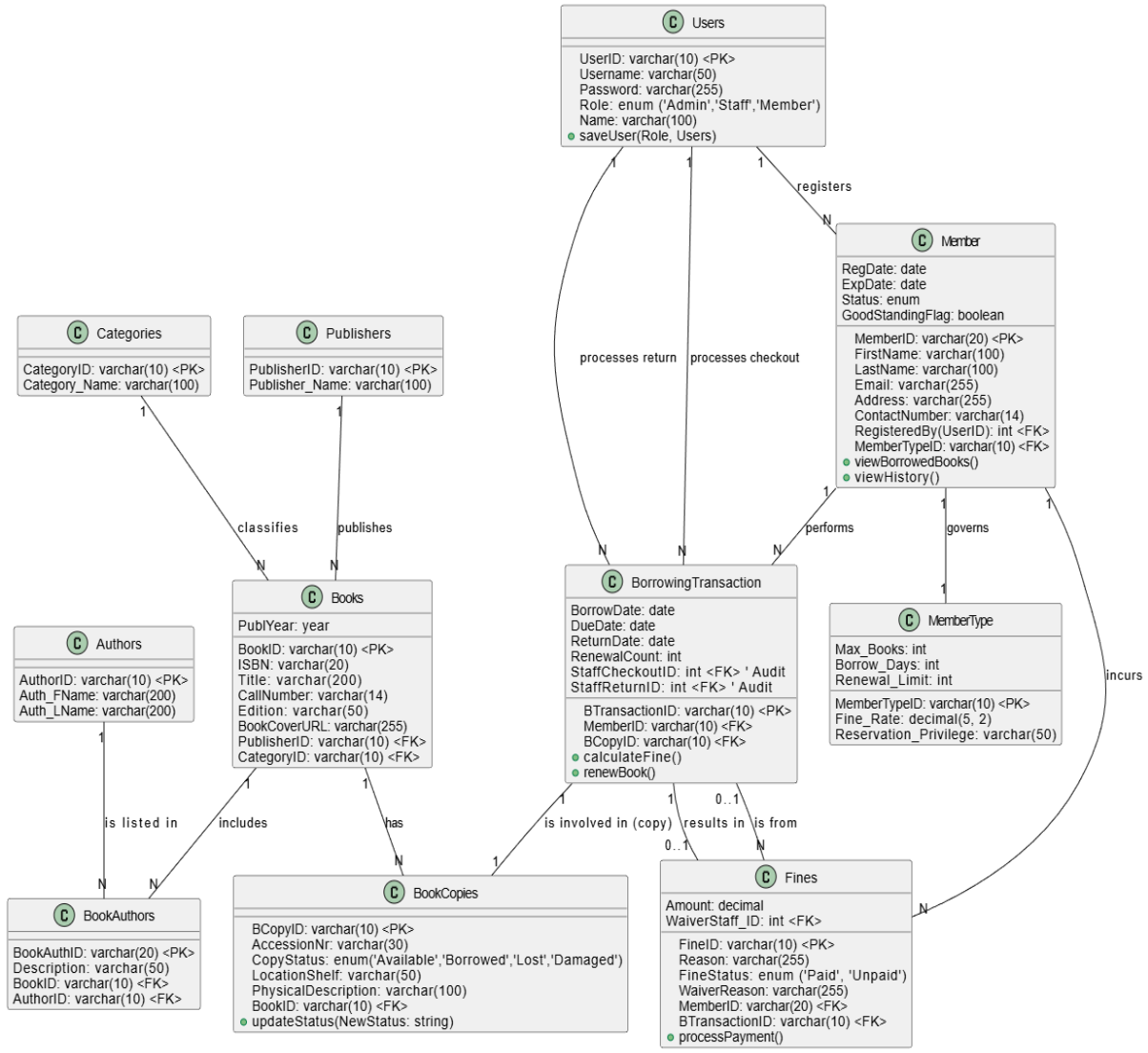

Figure 2.4 UML Class Diagram

Figure 2.4 illustrates the UML Class Diagram of the Library Management System. It shows the classes, attributes, and relationships that define the structure for managing Users, Books, Members, Borrowing Transactions, Reservations, and Fines.

USE CASE DIAGRAM

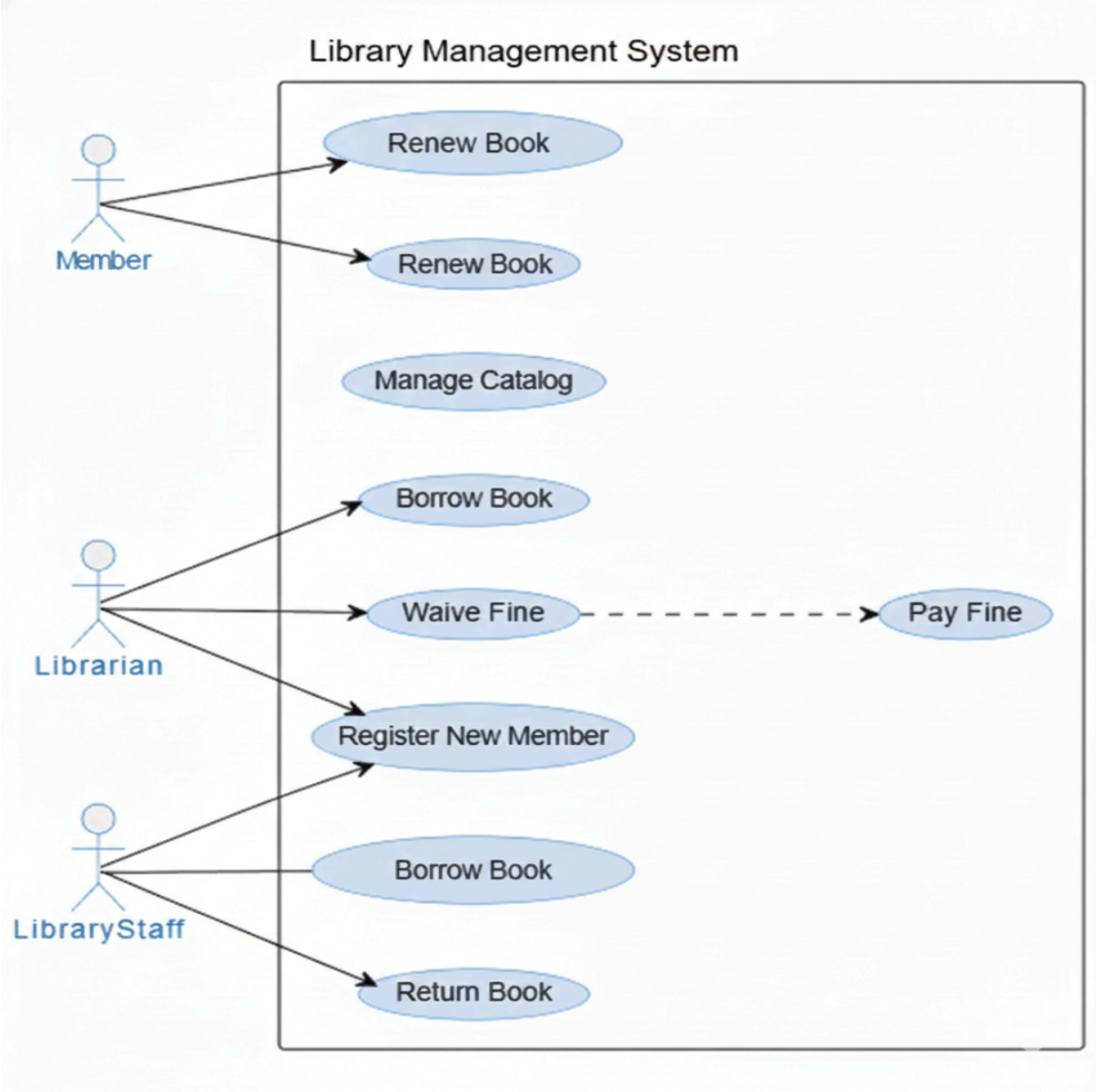

Figure 2.5 Use Case Diagram

Figure 2.5 illustrates the Use Case Diagram of the Library Management System. It shows the interactions of three key actors—Member, Librarian, and Library Staff—with the system, including core library processes such as Renew Book, Borrow Book, Manage Catalog, Borrow Book, Waive Fine, Pay Fine, Register New Member, Borrow Book, and Return Book.

ERD (Entity Relationship Diagram)

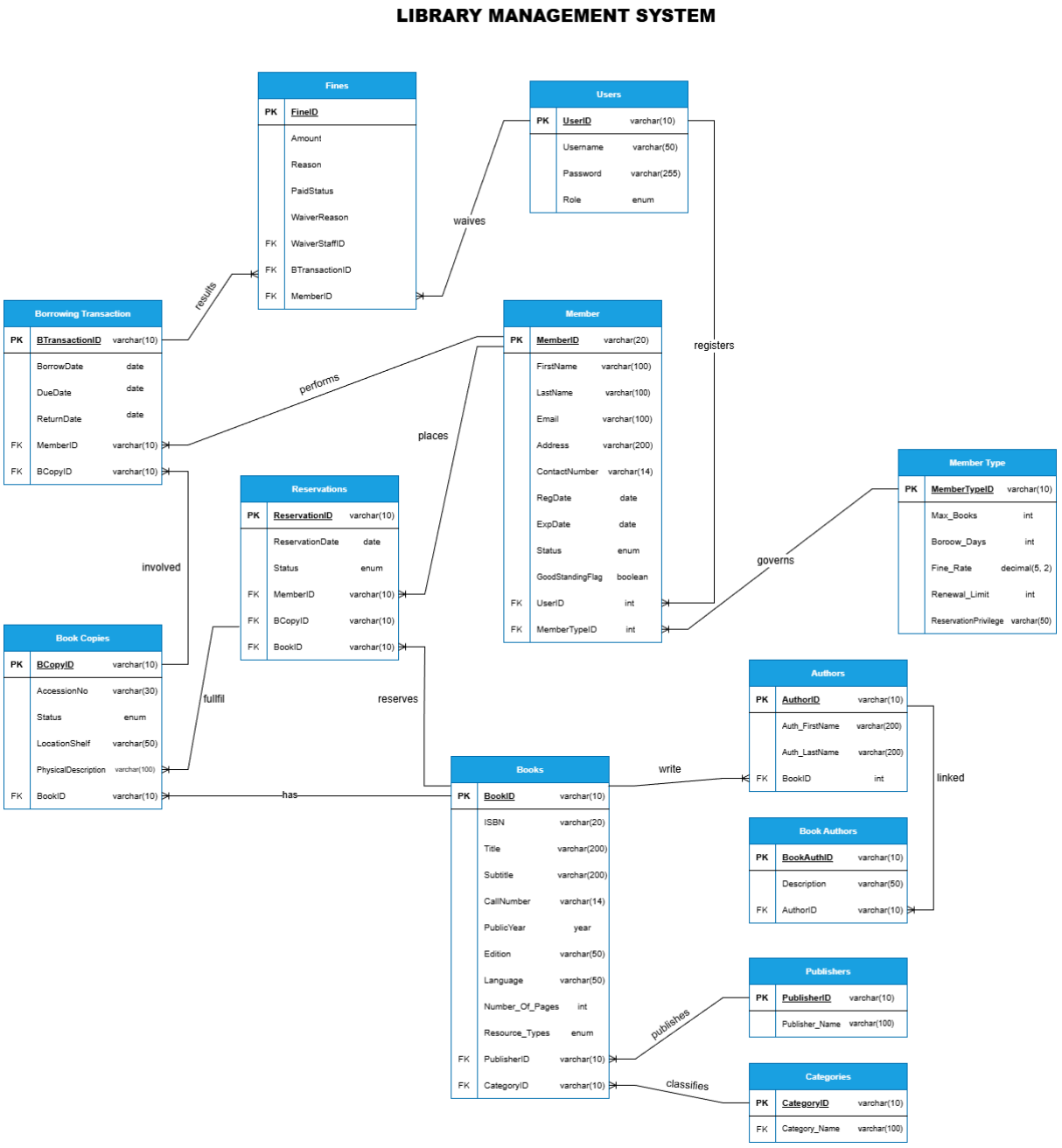

Figure 2.6 Entity Relationship Diagram

Figure 2.6 illustrates the Entity Relationship Diagram (ERD) of the Library Management System. It shows the entities and relationships in the database, including core entities like Users, Member, Books, Borrowing Transaction, and Fines, along with supporting entities such as Authors, Publishers, and Categories.

CHAPTER 3

SYSTEM REQUIREMENTS

Functional Requirements

1. **User Management:** The system must allow Librarians/Admins to create, view, edit, and deactivate accounts for Library Staff and Members, and assign role-based access privileges.
2. **Member Management:** The system must handle member registration, assign unique Member IDs, categorize members (Student, Faculty, Staff, Guest), and manage member status and borrowing privileges.
3. **Cataloging:** The system must allow staff to add, update, delete, and import book records, including essential metadata (ISBN, Author, Title) and manage multiple copies and their physical status.
4. **Circulation (Borrowing):** The system must facilitate book checkout by scanning Member ID and Book Accession Number, automatically validate borrowing eligibility against set rules, and update book and member statuses.
5. **Circulation (Return):** The system must facilitate book returns, automatically check for overdue status, calculate applicable fines, and update the book status to "Available."

Non-Functional Requirements

Performance

1. **Circulation Operation Speed:** End-to-end borrowing and return operations must complete in under 10 seconds to ensure a fast user experience at the service desk.

Reliability and Accuracy

1. **Accuracy (Fine Calculations):** The fine calculation logic must be 100% precise, correctly applying the defined fine rates and maximum caps based on member type and days overdue.
2. **Data Integrity (Availability Status):** The system must ensure the book availability status (Available, Borrowed, Lost, and Damaged) is always accurate and instantly updated upon transaction completion.

Security

- **Access Control:** The application must implement proper role-based access control (RBAC), strictly limiting access to sensitive functions (e.g., fine waivers, system configuration) based on the user's logged-in role (Admin, Staff).

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