EECS 447 Project

Conceptual Modeling

Version 1.4

Revision History

Date	Version	Description	Author
2/15/2025	1.1	All team members completed the first draft for the instructions of this document. All subsections, except Part 3 have been completed. Members defined and elaborated on all entities and relationships for the layout of the ER Model.	Sophia Jacob, Kusuma Murthy, Anna Lin, Nimra Syed, Ella Nguyen, Nikka Vuong
2/16/2025	1.2	All team members worked on Part 3 to refine the ER diagram and Section 2-3.	Sophia Jacob, Kusuma Murthy, Anna Lin, Nimra Syed, Ella Nguyen, Nikka Vuong
03/01/2025	1.3	Revisited the ER diagram and added new attributes and fixed names of attributes to be more descriptive and accurate.	Sophia Jacob, Kusuma Murthy, Anna Lin, Nimra Syed, Ella Nguyen, Nikka Vuong
03/08/2025	1.4	Revisited the ER diagram and added final edits.	Sophia Jacob, Kusuma Murthy, Anna Lin, Nimra Syed, Ella Nguyen, Nikka Vuong

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1 Introduction

1.1 Project Overview

As a Software as a Service (SaaS) company, ASKNrEceive (ASKNE) hopes to help streamline database creation and management. The purpose of this project is to provide local libraries with a Library Management System (LMS) that ensures efficiency for both types of end-users: library staff and library customers. This abstracted database will facilitate better documentation of the books, magazines, and other available items for ease of management and organization.

Through this project, ASKNE will develop a fully functional and scalable database software for libraries to handle, maintain, and analyze the popularity of their collections through detailed reports. Using a streamlined approach, the goal is to design a robust relational database with a well-defined conceptual schema and physical implementation.

**** Note: Refer to *01 - Project Plan/Vision* for any additional information on the project overview and definition of the project.**

1.2 Scope

ASKNE will use MySQL and other database management tools to deliver an extensive database backed in software to provide better insights and organization to libraries regarding books, magazines, and other content they house. This project entails creating a full-scale LMS, powered by a relational database. ASKNE aims to create a reporting style that helps the library determine popular books, members' favorite genres, and more quantifiable statistics to help maintain a growing library. This project will be responsible for managing the library's database operations such as adding new books as parts of entries, cleaning the database by removing and editing the borrow and return status of loanable items, and finally creating comprehensive reports for the Library admins and staff. Other features include tracking books and members based on a variety of attributes like author names, item IDs, publication dates, and more. Users can view the database for available books, while library staff can edit and maintain the database. As for the technical aspect of this project, ASKNE will be utilizing Structured Query Language (SQL) as the main tool used for searching the database and will create various tables that will be structured in a Relational database format.

**** Note: Refer to *01 - Project Plan/Vision* for any additional information on the scope and definition of the project.**

1.3 Glossary

**** Note: Our team has a dedicated Document for Abbreviations and Glossary. Refer to *07 - Glossary*.**

For the purpose of this document, it will also be put in this subsection.

- ASKNE - ASKNrEceive
- SaaS - Software as a Service
- LMS - Library Management System
- SQL - Structured Query Language

2 ER Modeling Components

**** Note: Refer to *02 - Database Requirements* for any additional information on the functional/non-functional requirements, entities, and relationships.**

2.1 Identify Entities

List all the major entities that will be part of your database. This includes the initial entities in the project description, the ones you identified during the requirements engineering, and the additional ones during your team brainstorming.

ASKNE's database will consist of the following major entities:

- Library Item: Represents the types of items that a member can check out.
    - Book: Represents physical and digital book items available in the library.
    - Digital Media Item: Represents digital resources like e-books, audiobooks, videos, and any digital content available in the library.
    - Magazine: Represents journals or periodicals available in the library.
- Library Account: Keeps track of daily revenue and incurred amount owed.
- Member Account: Specific account for each type of client.
- Client: Represents individuals interacting with our library system.
    - Library Members:
        - Regular: Standard borrowing privileges and fee structures.
        - Students: They can have extended borrowing limits and discounted fees.
        - Senior Citizens: They may have reduced fees and special borrowing privileges such as longer checkout periods.
    - Staff: They assist the library members in checking out library items.

2.2 Define Attributes

For each entity, list its attributes and specify the data types or constraints. For example, the Book entity might have attributes such as ISBN, Title, Author, Genre, Price, and Stock Quantity.

Entities	**Attributes**
Library Item (Generalization)	Item ID, Current Inventory
Book (Specialization of Library Item)	ISBN (International Standard Book Number), Title, Author/Creator, Publication Year, Genre, Availability Status, Book Rating
Digital Media Item (Specialization of Library Item)	ISBN (International Standard Book Number), Title, Author/Creator, Publication Year, Genre, Availability Status
Magazines (Specialization of Library Item)	ISSN (International Standard Serial Number), Title, Issue Number, Publication Date, Genre, Availability Status
Library Account	Date, Total Amount Paid Per Day, Total Amount Owed Per Day
Member Account	Account ID, Incurred Fees, Total Amount Paid, Overdue Balance, Member ID
Client (Generalization)	Client ID, Name, Contact Information, Membership Type, Account Status, Fine Rate
Staff (Specialization of Staff)	Staff ID, Role
Library Members (Specialization of Client/Generalization)	Member ID, Membership Type, Fee Type, Limit
Waitlist	{Request Date, Member ID, Item Name}, Waitlist Status
Regular (Specialization of Library Members)	N/A
Student (Specialization of Library Members)	N/A
Senior Citizens (Specialization of Library Members)	N/A

Relationships	**Entities**	**Attributes**
Borrow	Library Items → Regular Members, Students, Senior Citizens	{Item ID, Member ID, Checked-Out Date}, Due Date, Overdue Status, Available Limit, Checked-Out Status, Amount Paid, Amount Owed, Return Date
Recommend Books	Member Account → Client	N/A
Charge	Library Member → Library Account	N/A
Help	Library Member → Staff	N/A
Can Be	Staff → Library Member	N/A
View	Library Member → Member Account	N/A
Has	Client → Member Account	N/A
Paid	Staff → Library Account	Amount Owed, Amount Paid, Member ID
Rating	Library Member → Book	Stars Given
Added	Library Item → Waitlist	N/A

2.3 Define Relationships

A library provides services to clients. A client has a name, contact information, membership type, account status, and fine rate. Each client must have one member account. There are two types of clients: library members and staff.

Staff members have a staff ID and a role. Library members have a member ID, membership type, fee type, and limit (total number of books that can be checked out). Each membership type entails different rates for fees. For each overdue day, regular members, students, and senior citizens must pay $0.30, $0.20, and $0.15 respectively per item.

Each staff member can also be a library member if they would like to check out books. Staff may help multiple library members, and a single library member must be helped by one staff member.

This library has a library account. Each library account has the total amount paid per day, today's date, and the total amount overdue per day. Each staff member must get paid by the library account. The library account must pay at least 10 library staff. The database will record the amount owed, the amount paid, and the member ID. The library account can charge multiple library members (for incurring late fees).

There are three types of library members: regular members, students, and senior citizens. Regular members and senior citizens can borrow up to 5 library items in total. Student members can borrow up to 10 library items in total. Library members can be charged by one library account.

For each library item, the current inventory (number of copies left for the item) and item ID will be tracked. A library item may be borrowed by any one of the three members. The overdue status (whether the book is overdue), item ID, member ID, available limit (the number of items that can be borrowed within the limit), checked-out status (boolean representing whether the item is currently in possession of the library member), the amount owed, the amount paid, the due date, checked-out date, and return date are recorded with each borrowing transaction. Note that the client ID uniquely identifies each client based on their type. This is different from the member ID, which is specific to the library member. Client ID, on the other hand, is a general ID, since there can be clients that are both staff and library members or just one of these subsets.

If there is no more current inventory for a certain library item (inventory = 0), then we add a client on the waitlist. The waitlist entity has member ID, item name, and waitlist status attributes. A library item can be added to a waitlist, while a waitlist can have 0 or more items.

A library item is classified into three categories: books, digital media items, and magazines. Magazines have a title, issue number, ISSN, publication date, availability status, and genre. Digital media items have a title, author/creator, ISBN, publication year, genre, and availability status. Books have a title, author/creator, ISBN, publication year, genre, availability status, and book rating.

A member account must be associated with each client. A member account can also recommend at least one book to the client. Library members can view their member accounts, and a member account can be viewed by a library member. The member account consists of the incurred fees, the total

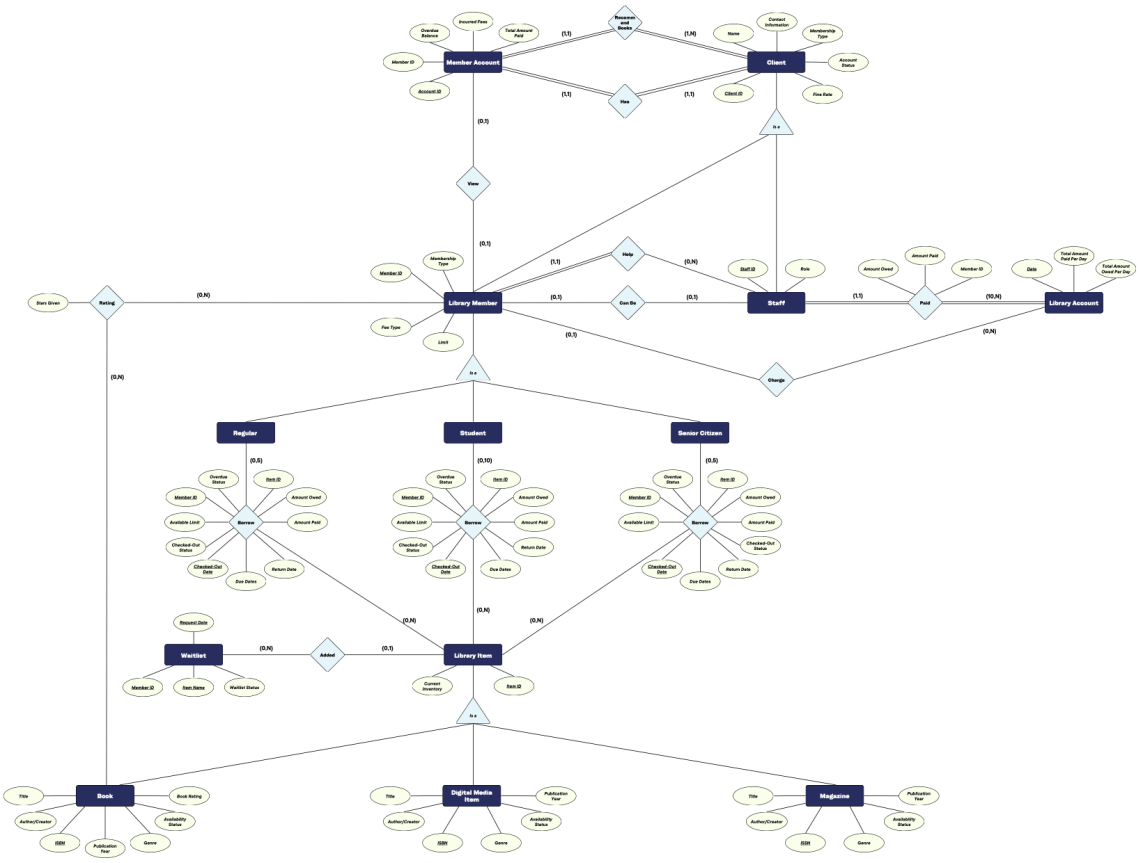
amount paid by that library member, the member ID it is associated with, the Account ID, and overdue balance to determine the amount owed.

Each book can be rated by library members. The given rating will be recorded on a 5-point scale. A library member may give a rating to a book.

3 ER Model

**** Note: To see the diagram better, click the link below for the PDF version.**

ER Model Link



4 Appendices

Refer to *01 - Project Plan/Vision* for any additional information on the scope and definition of the project.

Refer to *07 - Glossary* for any additional information regarding abbreviations and terms.

5 GitHub Repository Management

All members of the ASKNrEceive team will regularly manage, update, and commit to the GitHub Repository. The repository will be publicly available for view and accessed here: Library Database Management Project.

**** Note: All our Project Meeting Logs will be housed in the GitHub Repository on the Wiki Page. Please reference it as needed. Our Team Profile is also on the Wiki Page.**