LOGICAL RELATIONAL MODEL

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Introduction

Please note that the content of this document may be changed throughout the project's development.

Project Overview

The purpose of this database is to manage, track, and generate various reports of the operations and inventory of a small library.

Scope

From our original project plan:

> "This project encompasses the end-to-end creation of a relational database system tailored for a small library. Specifically, it includes analyzing library requirements, designing data models, implementing the schema in a DBMS, and setting up the rules for borrowing and membership management. The database will track a variety of loanable items, enforce borrowing restrictions, and provide meaningful reports to support library operations."

Glossary

- DBMS: Database Management System
- SQL: Structured Query Language
- PK: Primary Key
- FK: Foreign Key
- IDE: Integrated Development Environment
- ER: Entity-Relationship

Relational Schema Mapping

Identified Relations and Attributes

Relation Name: Media_Item
Attributes: media_id, title, author_id, isbn, publication_year, genre, availability

Relation Name: Media_Type
Attributes: media_type_id, name

Relation Name: Genre
Attributes: genre_id, name

Relation Name: Author
Attributes: author_id, first_name, last_name

Relation Name: User
Attributes: user_id, first_name, last_name, email, phone, is_staff, membership_type, account_status_id

Relation Name: Account_Status
Attributes: account_status_id, name, description

Relation Name: Fee
Attributes: fee_id, user_id, date_issued, amount, fee_status_id

Relation Name: Fee_Status
Attributes: name, description

Relation Name: Transaction
Attributes: transaction_id, media_id, user_id, checkout_date, due_date, return_date

Relation Name: Membership_Type
Attributes: membership_type_id, name, description, borrowing_limit

Defined Domains

For the domains of the relational schema mapping, please refer to the data dictionary.

Primary Keys

Relation	Primary Key(s)
Media_Item	media_id
Author	author_id
User	user_id
Fee	fee_id

Transaction	transaction_id
Fee_Status	fee_status_id
Genre	genre_id
Media_Type	media_type_id
Membership_Type	membership_type_id
Account_Status	account_status_id

Foreign Keys

Relation	Foreign Key(s)	References
Media_Item	author_id, genre_id, media_type_id	Author(author_id), Genre(genre_id), Media_Type(media_type_id)
Fee	user_id, fee_status_id	User(user_id), Fee_Status(fee_status_id)
Transaction	media_id, user_id	Media_Item(media_id), User(user_id)
User	membership_type_id, account_status_id	Membership_Type(membership_type_id), Account_Status(account_status_id)

Functional Dependencies

Media_Item :

- media_id → title, author_id, isbn, publication_year, genre_id, availability, media_type_id
- isbn → title, author_id, publication_year, genre_id, media_type_id

Media_Type :

- media_type_id → name

Genre:

- genre_id → name

Author:

- author_id → first_name, last_name

User:

- user_id → first_name, last_name, email, phone, is_staff, membership_type_id, account_status_id

- email → user_id, first_name, last_name, phone, is_staff, membership_type_id, account_status_id

Membership_Type :

- membership_type_id → name, description, borrowing_limit

Account_Status:

- account_status_id → name, description

Fee:

- fee_id → user_id, date_issued, amount, active
- user_id, date_issued → fee_id, amount, active

Fee_Status:

- fee_status_id → name, description

Transaction:

- transaction_id → user_id, media_id, checkout_date, due_date, return_date
- user_id, media_id, checkout_date → transaction_id, due_date, return_date

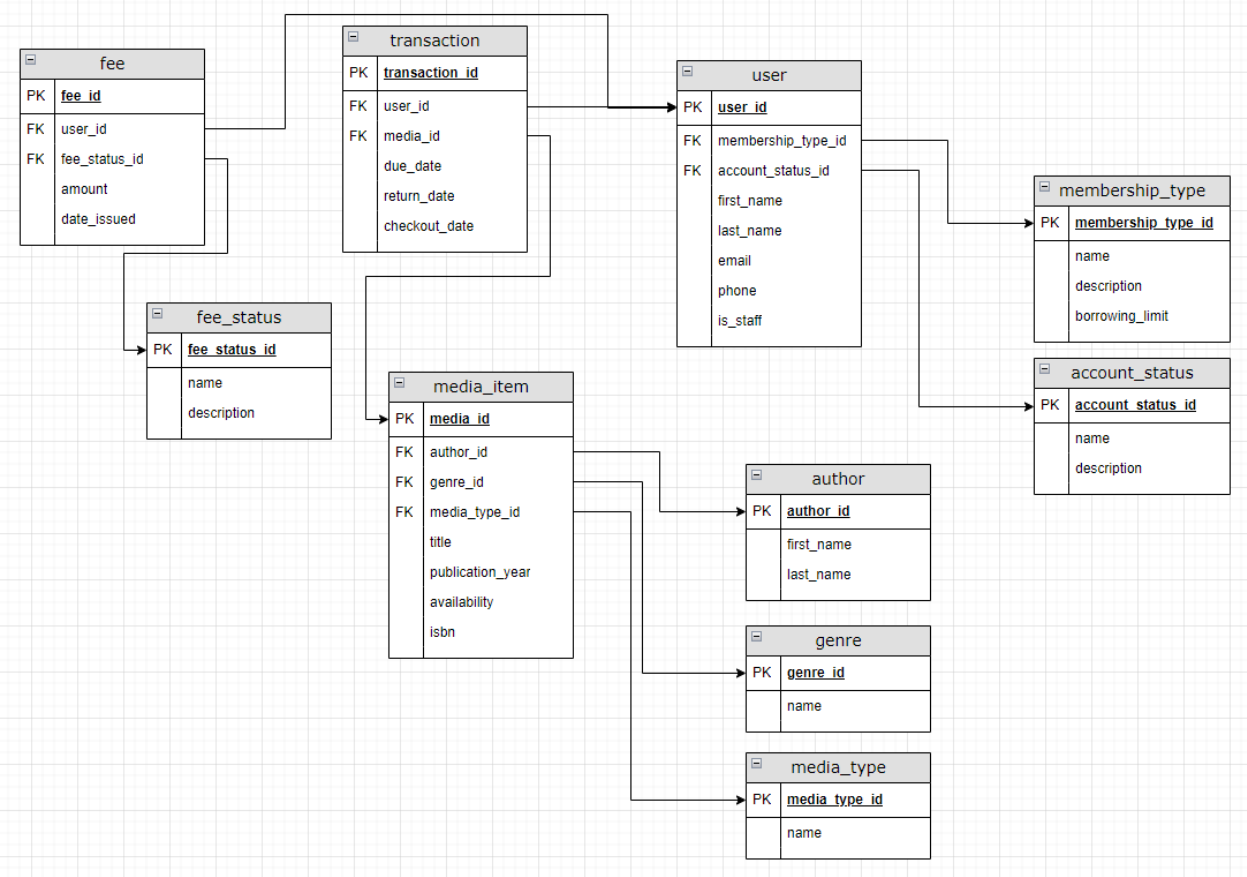
Membership_Type:

- membership_type_id → name, description, borrowing_limit

Account_Status:

- account_status → name, description

Relational Schema Diagram



Schema Documentation

Data Dictionary

Attribute Name	Data Type	Description	Domain/Range
media_id	INT	Media id is given to distinguish media into different types such as books, magazines, or others.	Min: 1 Max: N/A
title	NVARCHAR(255)	Title of the media	Min: 1 character Max: 255 characters
author_id	INT	Author id of a specific media	Min: 1 Max: N/A

isbn	NVARCHAR(13)	The isbn number given to media	As per ISBN-13, each must start with either 978 or 979. Min: 9780000000001 Max: 9799999999996
publication_year	DATE	Year that media was published	Min: 0001-01-01 00:00:00.000000 Max: 9999-12-31 23:59:59.999999
genre_id	INT	A number is given to a piece of media that matches to a specific genre	Min: 1 Max: N/A
availability	BIT	To show if a piece of media is available for checkout	Min: 0 Max: 1
first_name	NVARCHAR(100)	First name of a person (user, author)	Min: 1 character Max: 100 characters
last_name	NVARCHAR(100)	Last name of a person (user, author)	Min: 1 character Max: 100 characters
user_id	INT	Specific id given to a user	Min: 1 Max: N/A
is_staff	BIT	Shows if a user is a staff member or not	Min: 0 Max: 1
email	NVARCHAR(320)	Email of user	Must be in a valid email address format. Min: N/A Max: 320 characters

phone	NVARCHAR(10)	Phone number of user	Must be a valid phone number format. Only digits. Min: 10 digits Max: 10 digits
membership_type_id	INT	An id that determines membership type of a user	Min: 1 Max: N/A
borrowing_limit	INT	The maximum amount of books a user with the associated membership can check out	Min: 0 Max: 50
account_status_id	INT	An id that determines the status of an account	Min: 1 Max: N/A
status_name	NVARCHAR(50)	The textual/readable name of the associated account status	Min: 1 character Max: 50 characters
media_type_id	INT	The ID of the associated media type	Min: 1 Max: N/A
name	NVARCHAR(50)	The textual/readable format of the given identity (fee_status, account_status, genre, media_type, membership_type)	Min: 1 character Max: 50 characters
description	NVARCHAR(300)	Describes the purpose of the associated identity (fee_status, account_status, membership_type)	Min: 0 characters Max: 300 characters
fee_id	INT	Id to what type of fee for a user	Min: 1 Max: N/A
date_issued	DATETIME	Date of when fee was issued	Min: 0001-01-01 00:00:00.000000 Max: 9999-12-31 23:59:59.999999

amount	DECIMAL(10,2)	Fee amount that was issued	Min: 0.00 Max: 99999999.99
fee_status_id	INT	The ID of the associated fee status	Min: 1 Max: N/A
transaction_id	INT	Id for any transaction that is made	Min: 1 Max: N/A
checkout_date	DATETIME	Date when media was checked out	Min: 0001-01-01 00:00:00.000000 Max: 9999-12-31 23:59:59.999999
due_date	DATETIME	Date the piece of media is due to be returned	Min: 0001-01-01 00:00:00.000000 Max: 9999-12-31 23:59:59.999999
return_date	DATETIME	Date of when checked out media was returned	Min: 0001-01-01 00:00:00.000000 Max: 9999-12-31 23:59:59.999999

Normalization Considerations

The team has considered normalization for 3NF and have observed the following:

- We originally planned to have specific attributes as enums to make the system more modular. However, this might not entirely be in SQL, so we created tables and associated IDs instead of enums.

Appendices

N/A