LIBRARY DATABASE

Prepared for: DBMS

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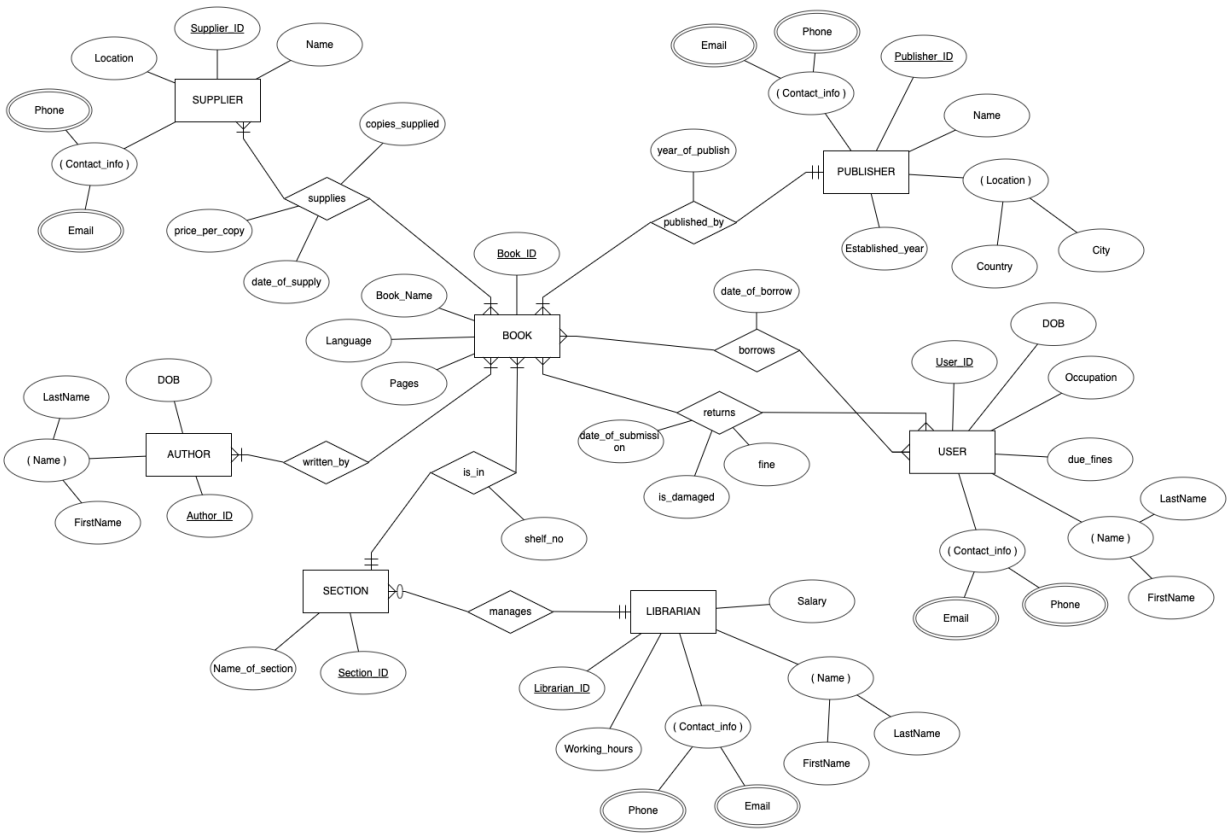
PROJECT OUTLINE

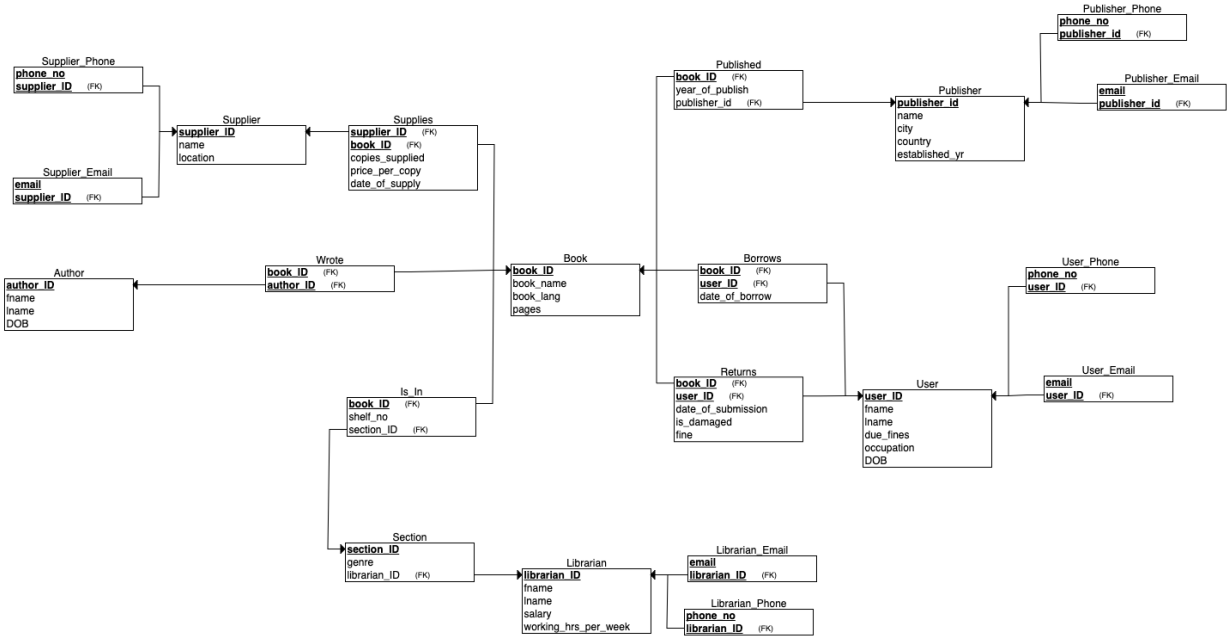
Problem Statement

The objective of this project is to represent clearly a library database management system. The main idea while creating the ER model and relational model for this database is to reduce the repetition of data as much as possible to ensure an efficient management system, i.e. to achieve Boyce-Codd Normal Form for all created database relations. The following ER Model and Relational Model were created using the ERDPlus online platform.

ER Model



Relational Model



Relationship Assumptions

- **Book to Author**: Each author could have written many books, and each book could likewise be written by multiple authors (i.e. co-authors). Moreover, it is mandatory for a book to have at least one author, and also for an author to have written at least book, by definition.
- **Book to Supplier**: Each supplier could supply multiple books to the library, and each book can be supplied by more than one supplier. By definition, each supplier must supply at least one book to the library.
- **Book to Publisher**: Each book must be published by exactly one publisher and each publisher must have published at least one book.
- **Book to Section**: Each book must belong in exactly one section so as to keep the library organised, and each section must contain at least one book.
- **Book to User**: In the *borrows* relationship, each user can borrow multiple books at a time, although it is not mandatory for a user to borrow a book. Also, a certain book can be borrowed by numerous users since the library stocks several copies of books. Furthermore, in the *returns* relationship, each user can return more than one book and each book can likewise be returned by more than one user.
- **Librarian to Section**: It is mandatory for each section to be managed by exactly one librarian, but each librarian can simultaneously manage various sections. It is also possible for a librarian to not be managing any section at a particular time.

Functional Dependencies

From the following functional dependencies it can be seen that all tables exist in Boyce-Codd Normal Form, as none of the non-key attributes are determinants in any of the dependencies.

Supplier

supplier_ID → supplier_ID

supplier_ID → name

supplier_ID → location

Supplier_Phone

phone_no, suppler_ID → Phone_no

phone_no, supplier_ID → supplier_ID

Supplier_Email

email supplier_ID → email

email supplier_ID → supplier_ID

Publisher

publisher_ID → name

publisher_ID → city

publisher_ID → country

publisher_ID → established_yr

Publisher_Phone

phone_no, publisher_id → phone_no

phone_no, publisher_id → publisher_id

Publisher_Email

email, publisher_id → email

email, publisher_id → publisher_id

Author

author_ID → fname

author_ID → lname

author_ID →DOB

Librarian

librarian_ID → fname

librarian_ID → lname

librarian_ID → salary

librarian_ID → working_hrs_per_week

Librarian_Email

email, librarian_ID → email

email, librarian_ID → librarian_ID

Librarian_Phone

phone_no, librarian_ID → phone_no

phone_no, librarian_ID → librarian_ID

Section

section_ID → genre

section_ID → librarian_ID

User

user_ID → fname

user_ID → lname

user_ID → due_fines

user_ID → occupation

user_ID → DOB

User_Phone

phone_no, user_ID → phone_no

phone_no, user_ID → user_ID

User_Email

email, user_ID → email

email, user_ID → user_ID

Book

book_ID → book_name

book_ID → book_lang

book_ID →pages

Published

book_ID → publisher_ID

book_ID → year_of_publish

Supplies

Supplier_ID, book_ID → supplier_ID

Supplier_ID, book_ID → book_ID

Supplier_ID, book_ID → copies_supplied

Supplier_ID, book_ID → price_per_copy

Supplier_ID, book_ID → date_of_supply

Is_In

book_ID → section_ID

book_ID → shell_no

Wrote

book_ID, author_ID → book_ID

book_ID, author_ID → author_ID

Borrows

book_ID, user_ID → book_ID

book_ID, user_ID → user_ID

book_ID, user_ID → date_of_borrow

Returns

book_ID, user_ID → book_ID

book_ID, user_ID → user_ID

book_ID, user_ID → date_of_submission

book_ID, user_ID → fine

book_ID, user_ID → is_damaged