Databases
Semester Project

I.   Topic

You have been tasked by the Director of the School Library Network in Public Schools to create a system that will store and manage all the necessary information for operating a School Library in Public Schools. Your implementation will be accessible to every public school with physical space to house the School Library, in order to satisfy the technological requirements of the Library's operation.

Your application, should handle the following:

- School operating the library. For each school, the following details should be registered: School name, Address, City, Phone number, Email, Full name of the School Director, Full name of the responsible School Library Operator. Each school unit (through the School Library Operator) is responsible for registering the school's library available books in the system.
- Books with their respective data (title, publisher, ISBN[1], authors, number of pages, summary, available copies/ inventory, image, thematic category, language, keywords). Each book has one or more authors and belongs to one or more categories.
- Application Users: For each user, the system must verify their identity when accessing the application (via username/password) and each user can change his own password.
    - Network School Library Administrator (Administrator):   Registers Schools and approves/appoints School Library Operators. They can create a backup copy of the entire database and restore the system from it.
    - School Library Operator. Operators are responsible for the operation of the School Library at the school unit level. Operators have the ability to process all the information of the books included in the system and to add new ones. They also supervise reservations and loans, either collectively or by searching by user. (Delayed returns are displayed separately). They can record the return of a borrowed title. They can record the loan of a copy when there is a reservation for that particular title, provided that the user's loan limits are met and that no returns are delayed. They also record loans without reservations, by searching for the user and title, if the user meets the loan criteria mentioned above and if there are available copies.
    - All school students, as well as the professors, can register and use the system. Approval from Operator is required for registration. After approving each user, the Operator prints out the borrower's card and delivers it to the user. Additionally, the Operator is authorized to delete or disable user accounts in accordance with the library's policy. Educators have the ability to modify their personal information, while students are only able to view it.

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[1] https://en.wikipedia.org/wiki/ISBN

- Book borrowing: Each user of the system, at the level of the school unit, can view available books, evaluate them and request to borrow a copy. Each student user can borrow up to two books per week, while professors can borrow one per week. Borrowing/returning of books is handled by the Operator. In case a copy of the book is not available, the user's request (reservation) is put on hold and is served upon the return of a copy.
- Reservations: Regarding reservations, the borrowing limits apply, e.g., two reservations per week for students. A reservation cannot be made if a book has not been returned on time or if the same user has already borrowed the title. Users have the option to cancel any current reservations. Additionally, reservations have a time frame of one week and are automatically canceled once it expires.
- Reviews: Users can share their thoughts about a book in a written review and provide a rating using the Likert[2] scale. Reviews written by students will be published upon approval by the Operator.

In addition to inputting the aforementioned information, all users of the application must have the ability to manage information, including a search mechanism and options for updating or deleting it (CRUD).

Specifications and reports may not have been sufficiently defined by the Director of the School Libraries Network. To ensure completeness of your work, it might be necessary to record the system specifications in detail, as well as any assumptions you make. A similar application can be viewed at https://mylib.gr/.

1. (10%) Design the ER diagram.
2. (20%) Design the relational diagram and implement the database.
    2.1. (5%) DDL and DML scripts.
    2.2. (5%) Define all necessary constraints to ensure correctness of the database. These include integrity constraints, keys, referential integrity, domain integrity, and user-defined constraints.
    2.3. (5%) Insert information for each entity into the database. The database should have enough data to successfully execute all queries and return the appropriate information. <u>Indicatively</u>, there should be more than 3 schools, 100 books, 50 title loans, 40 reservations, 30 students, and 10 teachers.
    2.4. (5%) Define appropriate indexes for the tables and justify your choice based on their usefulness for the queries they are used in.
3. Application and User Interface (UI). To fulfill this requirement, you need to develop an application with a user interface that emphasizes on practicality and functionality rather than visual appeal. The UI should be designed to be user-friendly, without requiring the end user to have any knowledge of SQL or database elements. All necessary information should be presented through relevant forms within the application. Additionally, you should incorporate appropriate elements such as drop-down lists, radio buttons, choice elements, and others where applicable.
4. Users should be able to execute and view results for the following queries:
    4.1. **(Administrator)** (35% - queries are equally graded):
        4.1.1. List with the total number of loans per school (Search criteria: year, calendar month, e.g. January).
        4.1.2. For a given book category (user-selected), which authors belong to it and which teachers have borrowed books from that category in the last year?
        4.1.3. Find young teachers (age < 40 years) who have borrowed the most books and the number of books.

4.1.4. Find authors whose books have not been borrowed.

4.1.5. Which operators have loaned the same number of books in a year with more than 20 loans?

4.1.6. Many books cover more than one category. Among field pairs (e.g., history and poetry) that are common in books, find the top-3 pairs that appeared in borrowings.

4.1.7. Find all authors who have written at least 5 books less than the author with the most books.

4.2. **(Operator)** (15%):

4.2.1. All books by Title, Author (Search criteria: title/ category/ author/ copies).

4.2.2. Find all borrowers who own at least one book and have delayed its return. (Search criteria: First Name, Last Name, Delay Days).

4.2.3. Average Ratings per borrower and category (Search criteria: user/category)

4.3. **(User)** (10%)

4.3.1. List with all books (Search criteria: title/category/author), ability to select a book and create a reservation request.

4.3.2. List of all books borrowed by this user.

5. User Manual: (10%): A user manual (in PDF format) that will provide instructions for using your application.

II.   Additional information

- You may freely form a team with your partners; maximum number of students per team is 3. You should register your team not later than the 23th of April 2022.
- Development: We recommend the use of MySQL (MariaDB) or PostgreSQL for RDBMS, a Web Server for the communication between server and client, PHP or Java or Python or Node JS for the server-side development and HTML for the client-side presentation.
- Projects developed using ORM technologies will not be accepted.
- Copying is strictly prohibited. If plagiarism is detected (even partial), all copies of the projects will be evaluated with zero.
- Queries must be implemented in an elegant and efficient way in SQL language.
- You can make your own assumptions and justify them in order to implement the desired functionality.

III.   Project Report
(**Dealine 28/5/2022**). The report should include:

1. ER Diagram & Relational Schema Diagram of the Database along with indexes and explanation of the model.
2. DDL and DML scripts
3. User Manual
4. Steps for the installation of your application and any required libraries. All the configuration files required to install the application from scratch.
5. Link to the GitHub repository of your work. If the repository is not public, you must grant us access until the day of the demo. The repository should contain, apart from the above mentioned, the source code of your application.

IV.   Demo

Presentation of the project will take place during the week 29 May 2023 - 2 June 2023 - before the exams - and you must bring your own device (i.e., laptop) with the application installed.

V.   Deadlines

The following dates are final and no extension shall be given.

A/A	Date	Event
1.	23/4/2022	Team Registration
2.	28/5/2022	Project Report
3.	29/5-2/6/2023	Demo