

RIGA TECHNICAL UNIVERSITY
FACULTY OF COMPUTER SCIENCE AND INFORMATION
TECHNOLOGY
INSTITUTE OF APPLIED COMPUTER SYSTEMS

Practical Assignment #2
“Database Management Systems”
Design and Implementation of Database

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1 Task – Database Design and Implementation

1. Choose topic (shop, school, university, airport etc.)
2. Give short description of chosen topic
3. Design database conceptual model using CASE tool PowerDesigner (ER model)
 - a. At least 5 entities (in Conceptual model) 20 attributes (please don't use entities with similar structure, example: entities Patients, Doctors, Nurses which have FirstName, Last name, BirthDate etc.)
 - b. 1:1, 1:N, **N:M** and unary relationships
 - c. Different attributes data types (date, float, integer, text)
4. Generate logical data model in the tool and explore and describe the changes in model;
5. Specify database management system "Oracle" and generate database physical model.
6. Generate the SQL script file from generated database physical model;
7. Generate database script;
8. Verify the generated database correspondence to initially designed conceptual model;
9. Write conclusion: at least 250 words;
10. Upload 2 files, types and naming:
 - a. Word: DBMS_2_YourSurname.docx;
 - b. Script: DBMS_2_YourSurname.sql.

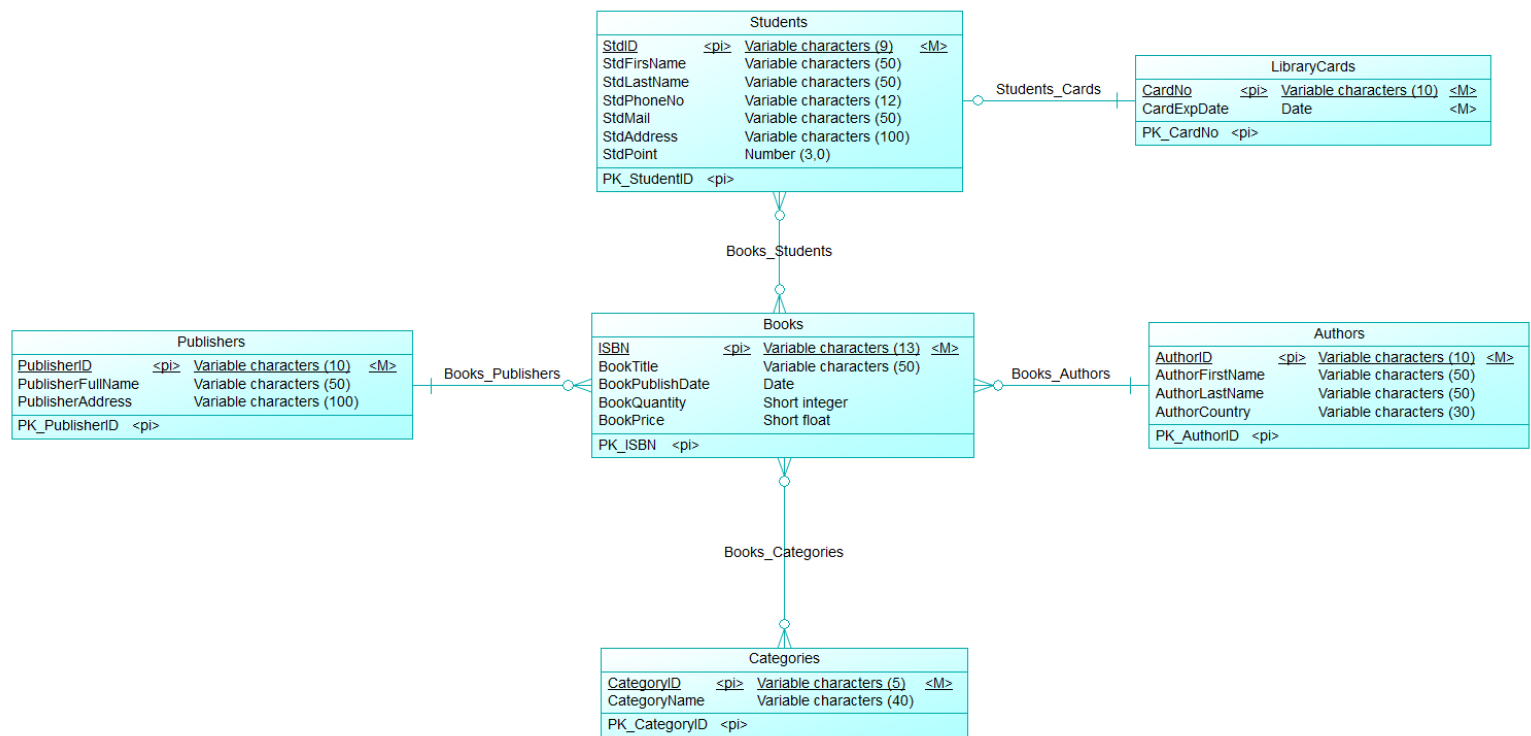
2 Topic Description

I chose the *Library of a University* as a subject for the database design homework. Entities in this database are *books*, *categories*, *writers*, *publishers*, *students*, and *library cards*. There is a “many to many” relationship between the students who borrow and deliver the books in the library. For this reason, an additional table is formed, and book loan-delivery dates are added to this table. Other than that, other relationships are clearly evident.

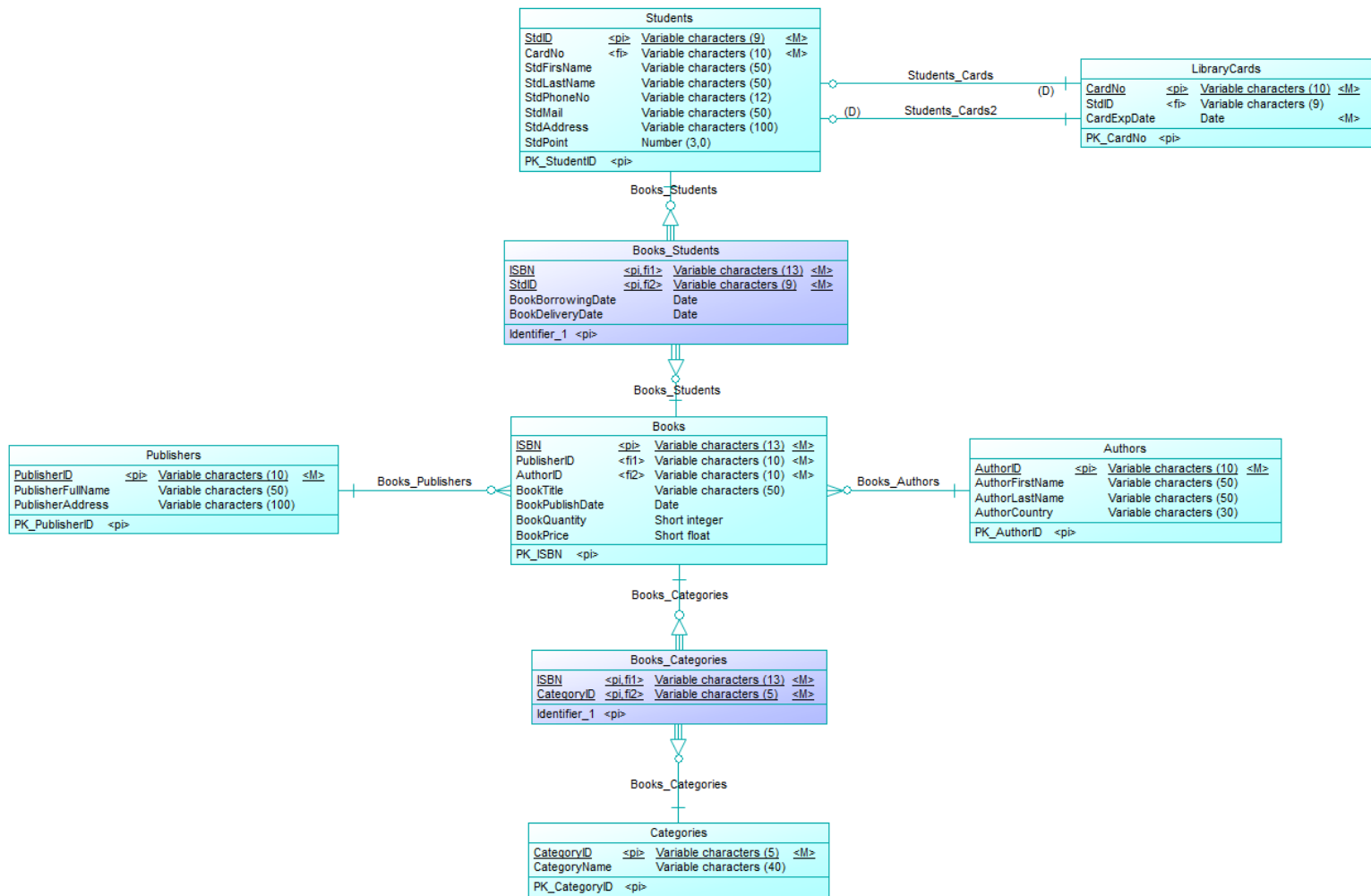
- *What is the main business process, the database is designed for?*
 - The main purpose of the database is to ensure that the books in a university and the data about these books are properly kept and updated. The borrowing and delivery dates of the students can be kept on record. Each student gets 100 points when they register in the library. Students who deliver the borrowed book in more than a month will receive a -10 point penalty. Students whose score goes below zero will be fined.
- *What are the most important data?*
 - Since the prepared design is a library database, the most important data are books. The rest of the data occurs depending on the books.
- *Who and how will use these data?*
 - This library database can be used by the university where the library is located, to manage the data, to have information about the data and to make the necessary updates.
- *What are the causalities between data and what are the constraints?*
 - Each book has only one main author, and an author can write more than one book.
 - Each book has only one publisher, and a publisher can print more than one book.
 - A book can be used by multiple students thanks to its printed copies, and a student can borrow and deliver multiple books.
 - A book can have various categories, and a category can have numerous books.
 - A student can only have one library card, and a unique library card can be held by at most one student.

3 Main Sections of Practical Work

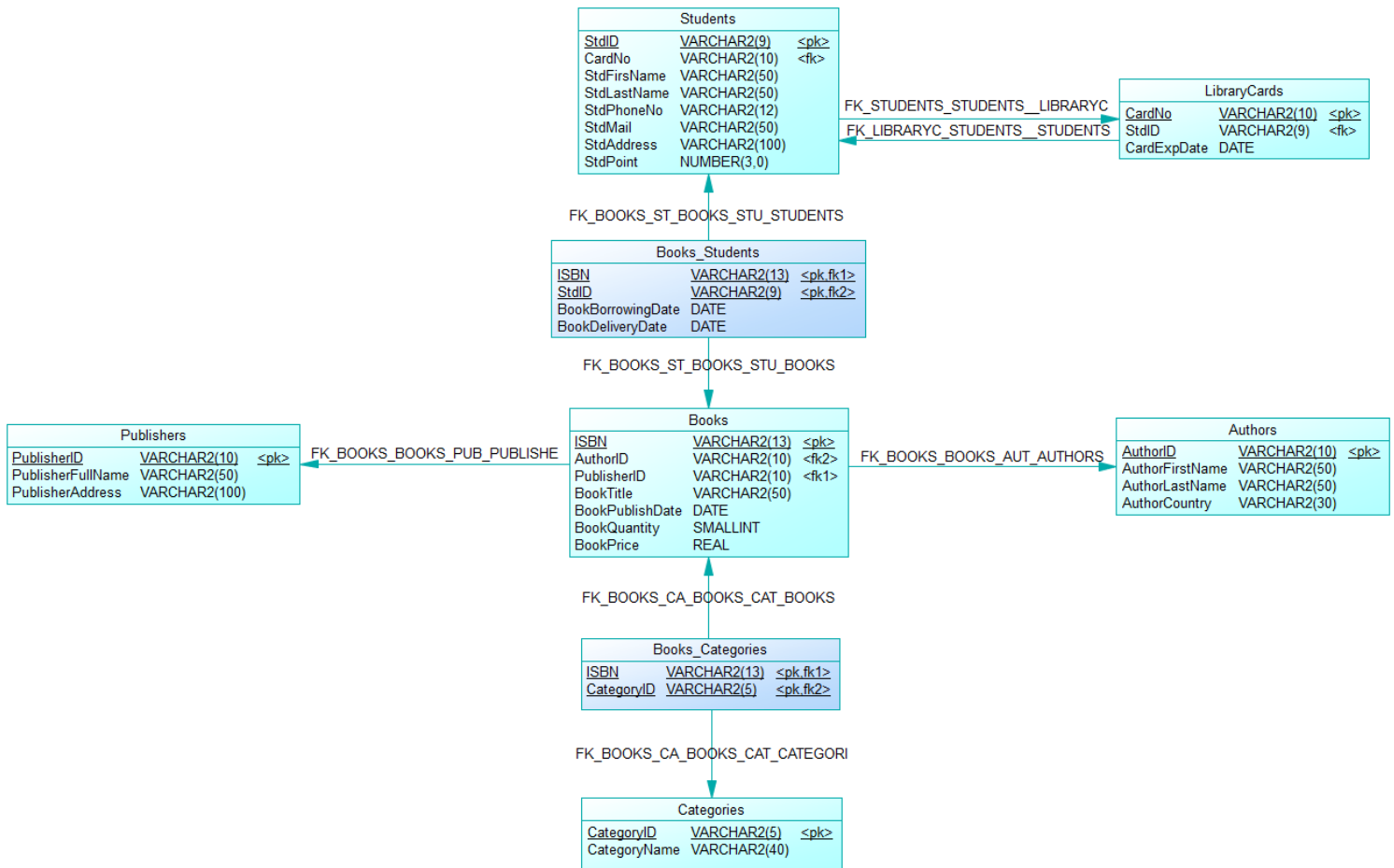
3.1 Conceptual Model



3.2 Logical Model



3.3 Physical Model



3.4 Script and SQL Developer

The screenshot displays the SQL Developer environment. The top window, titled 'Library.sql', contains the following SQL script:

```
/*=====*/
/* DBMS name:    ORACLE Version 12c          */
/* Created on:    07/03/2023 23:35:13         */
/*=====*/

alter table BOOKS
  drop constraint FK_BOOKS_BOOKS_AUT_AUTHORS;

alter table BOOKS
  drop constraint FK_BOOKS_BOOKS_PUB_PUBLISHE;

alter table BOOKS_CATEGORIES
  drop constraint FK_BOOKS_CA_BOOKS_CAT_BOOKS;

alter table BOOKS_CATEGORIES
```

The bottom window, titled 'Script Output', shows the execution results:

```
Table BOOKS_CATEGORIES altered.

Table BOOKS_STUDENTS altered.

Table BOOKS_STUDENTS altered.

Table LIBRARYCARDS altered.

Table STUDENTS altered.
```

The 'Script Output' window also indicates 'Task completed in 0.586 seconds'.

4 Conclusions

As part of the database design assignment, I created a library database for a university in conceptual, logical, and physical models. I prepared the study according to the features that a university library should have. In general terms, the study complies with the determined objectives. It contains more than five entities, and more than twenty properties, all relationship types are available, and different data types are used.

I started the work by creating the book data that must first be found in a library. Then I added the authors, publishers, and categories from the features included in the books. Then I added the data of the students who were able to use these books. Finally, I added the data of the unique library cards owned by each student and completed the database. I have viewed this database in the logical model. Then I created the SQL script from the physical model and used it in Oracle. Thanks to the script I added to Oracle, tables were created in the database management system. I had the chance to view these tables in the database system. Later, I realized that if I wanted, I could add data to these tables with a few codes I would write in the script. This assignment taught me the basic steps necessary to create a database.

During the work, I learned that a new table is created for "many to many" relationship types when converting the conceptual model to logical or physical models. And I realized that this unique table is handy for other features that need to be added.

5 References

- <https://riptutorial.com/sql/example/4978/library-database>
- <https://vertabelo.com/blog/database-for-library-system/>
- Riga Technical University, Faculty of Computer Science and Information Technology, Institute of Applied Computer Systems, DSP201 – Database Management Systems, Presentations