

Library Database

Design and Implementation Report - Phase 2

Group:

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1.1 Data Requirements

The library wants to keep track of:

- » The books (BOOKS) in it, and:
 - Each book's title (BoTitle)
 - The unique ISBN (ISBN) each book has
 - The credited authors for each book (BoAuthors: a first name, a middle initial, and a last name)
 - The date the book was published (BoPubDate)
 - How many copies (BoCopies) are available for each book
 - The publisher (PUBLISHER) that sold it the book, when they sold it, and how many copies of the book were sold
 - Which section (SECTION) each book is stored in
 - If the book was borrowed out; The customer (CUSTOMER) that borrowed it and for how long are they gonna borrow it
 - If the book was purchased; The customer (CUSTOMER) that bought them, how many copies they bought, when did they buy it, and which employee (EMPLOYEE) sold the books
- » The publishers (PUBLISHER) that supply the books, and:
 - Each publisher's unique ID (PID)
 - The name of each publisher (PName)
 - What books (BOOK) each publisher sold to the library , how many copies were sold, and the date of the transaction
- » The sections (SECTION) housed in it, and:
 - Each section's unique ID (SecID)
 - Which floor the section is in (SecFloor)
 - The category of books it stores (SecCategory)
 - The books (BOOK) each section stores
 - Each section's manager (EMPLOYEE)
 - The employees that work in each section (EMPLOYEE)

- » The people it employs (EMPLOYEE), and
 - Each employee's full name (EmName: a first name, and a last name)
 - Every employee's unique ID (EmID)
 - The birth date of each Employee (EmDOB)
 - The employee's role (EmRole)
 - Each employee's gender (EmGender)
 - The hours assigned to each employee (EmHours)
 - How much each employee is paid (EmSalary)
 - If the employee is a manager; the sections (SECTION) they manage
 - The section (SECTION) each employee works in
 - Each employees dependents (DEPENDENT)

- » Its customers (CUSTOMERS); and
 - The customer's full name (CusName: a first name, and a last name)
 - The unique ID of each customer (CusID)
 - The date of birth for each customer (CusDOB)
 - The different ways to contact a customer (ContactInfo: phone number or e-mail)
 - If the customer has borrowed; which books (BOOKS) they borrowed, and for how long they will keep them.
 - If the customer has purchased; which books (BOOKS) did they purchase, how many copies did they buy, when was the purchase held, and the employee (EMPLOYEE) that managed the transaction
 - If the customer has a reservation; which studyroom (STUDYROOM) did they reserve, when did they reserve it for, and for how long

- » The studyrooms (STUDYROOMS) it makes available; and
 - Each room's unique number (RoomNo)
 - What type of each room is (RoomType)
 - If a room was reserved; which customer (CUSTOMER) reserved it, when was it reserved for, and for how long

- » The dependents (DEPENDENTS) each employee has; and
 - Each dependent's name (DName)
 - Each dependent's gender (DGender)
 - The relationship each dependent has to the employee (DRelationship)

1.2 Business Rules

- » Only registered customers are allowed to purchase and borrow books.
- » Customers can only reserve 1 studyroom at a time.
- » Customers are only allowed to borrow 2 books at a time.
- » Only a maximum of 50 sections per library floor.
- » A section can only have a maximum of 5 employees working in it.
- » A publisher can only supply a maximum of 30 copies per book at a time.
- » Only employees that have a cashier role can facilitate the sale of books.
- » An employee must work a minimum 30 hours per week and a maximum of 40 hours per week.
- » Only 3 dependents are allowed to be registered per employee.
- » Studyrooms can only have 2 type ("Individual", "Group").
- » Studyrooms can only be reserved during work hours.
- » A Studyroom can not be reserved by a customer if it is already being reserved.
- » Studyrooms can only be reserved for a maximum of 3 hours per customer.

1.3 ER Diagram Design

1.3.1 ER Entities

» **BOOKS (Regular Entity)**

Attribute	Constraint	Type	Justification
BoTitle	Can't be null	Simple	
ISBN	Can't be null Unique	Potential key	
BoAuthors	Can't be null	Multivalued- Composite: (Fname, MInitial, LName)	Some books have multiple authors credited together.
BoPubDate	Can't be null	Simple	
BoCopies	Can't be null Must be positive	Simple	
BoPrice	Can't be null Must be positive	Simple	

» **SECTION (Regular Entity)**

Attribute	Constraint	Type	Justification
SecID	Can't be null Unique	Potential key	
SecFloor	Can't be null Must be positive	Simple	
SecCategory	Can't be null	Simple	

» **PUBLISHER (Regular Entity)**

Attribute	Constraint	Type	Justification
PID	Can't be null Unique	Potential Key	
PName	Can't be null	Simple	

» **CUSTOMER (Regular Entity)**

Attribute	Constraint	Type	Justification
CusName	Can't be null	Composite: (Fname, LName)	
CusID	Can't be null Unique	Potential Key	
CusDOB	Can't be null	Simple	
ContactInfo	Can't be null	Multivalued	The customer are free to provide either a phone number or email or both.

» **STUDYROOM (Regular Entity)**

Attribute	Constraint	Type	Justification
RoomNo	Can't be null Unique	Potential Key	
RoomType	Can't be null	Simple	

» **EMPLOYEE (Regular Entity)**

Attribute	Constraint	Type	Justification
EmpName	Can't be null	Composite: (Fname, LName)	
EmID	Can't be null Unique	Potential Key	
EmSex	Can't be null	Simple	
EmDOB	Can't be null	Simple	
EmRole	Can't be null	Simple	
EmHours	Can't be null	Simple	
EmSalary	Can't be null Must be positive	Simple	

» **DEPENDENT (Weak Entity)**

Attribute	Constraint	Type	Justification
DName	Can't be null	Composite: (Fname, LName)	
DSex	Can't be null	Simple	
Relation	Can't be null	Simple	

1.3.2 ER Relationships

» **Sold (Regular Relationship)**

Entities	Participation	Cardinality Ratio	Justification
BOOK	Total	M	
SECTION	Total	1	

» **Stored_In (Regular Relationship)**

Entities	Participation	Cardinality Ratio	Justification
BOOK	Total	M	
SECTION	Total	1	

» **Purchased_By (Regular Relationship)**

Entities	Participation	Cardinality Ratio	Justification
BOOK	Partial	M	
CUSTOMER	Partial	N	

» **Borrowed_By (Regular Relationship)**

Entities	Participation	Cardinality Ratio	Justification
BOOK	Partial	M	
CUSTOMER	Partial	N	

» **Manages (Regular Relationship)**

Entities	Participation	Cardinality Ratio	Justification
EMPLOYEE	Partial	1	
SECTION	Partial	M	

» **Works_In (Regular Relationship)**

Entities	Participation	Cardinality Ratio	Justification
EMPLOYEE	Partial	M	
SECTION	Partial	1	

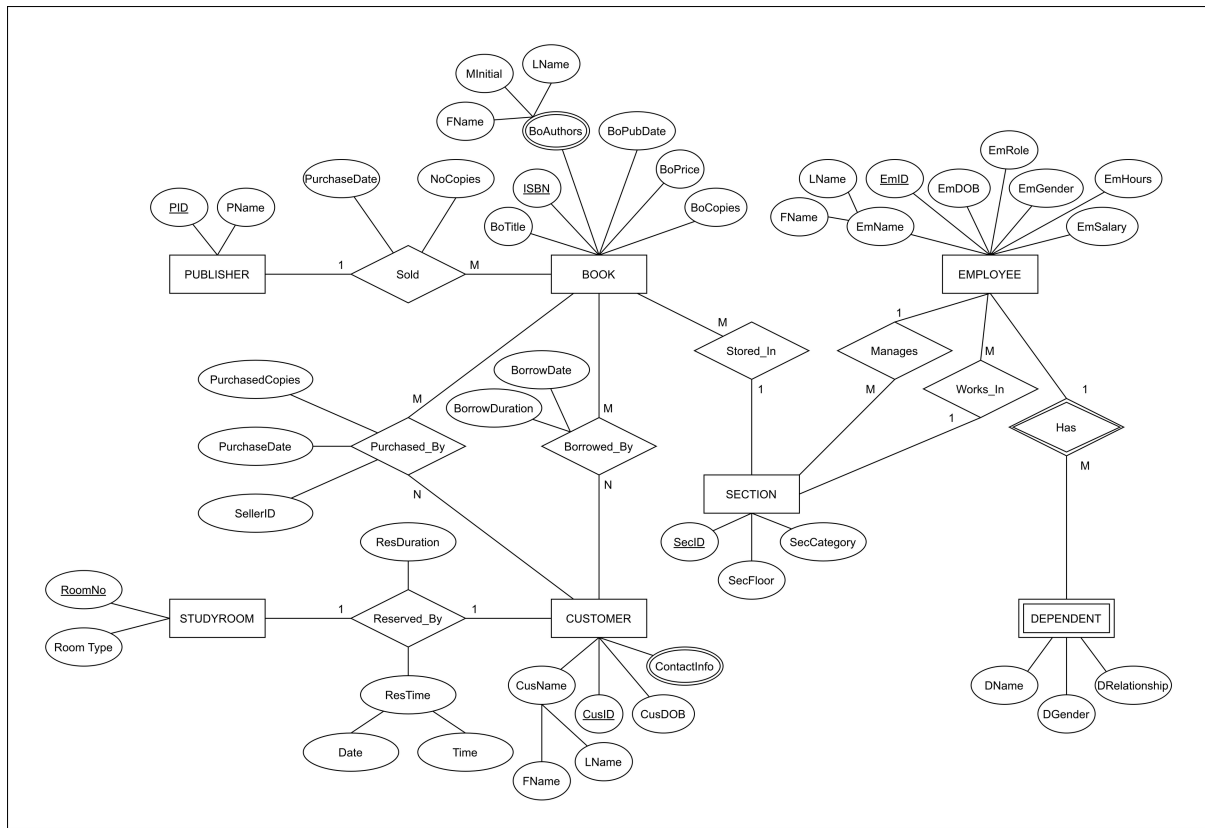
» **Has (Identifying Relationship)**

Entities	Participation	Cardinality Ratio	Justification
EMPLOYEE	Partial	1	
DEPENDENT	Partial	M	

» **Reserved_By (Regular Relationship)**

Entities	Participation	Cardinality Ratio	Justification
STUDYROOM	Partial	1	
CUSTOMER	Partial	1	

1.4.3 ER diagram



1.5 ER to logical schema mapping

1.5.1 Mapping of regular entity type

PUBLISHER

<u>PID</u>	PName
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BOOK

<u>ISBN</u>	Title	PubDate	Price	Copies
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EMPLOYEE

<u>ID</u>	FName	LName	DOB	Role	Gender	Hours	Salary
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SECTION

<u>ID</u>	Catagory	Floor
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STUDYROOM

<u>RoomNo</u>	RoomType
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CUSTOMER

<u>ID</u>	FName	LName	DOB
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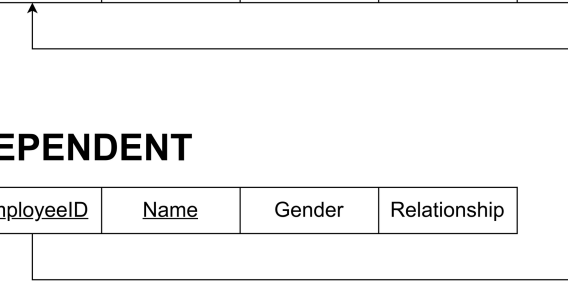
1.5.2 Mapping of Weak entity type

EMPLOYEE

<u>ID</u>	FName	LName	DOB	Role	Gender	Hours	Salary
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DEPENDENT

<u>EmployeeID</u>	<u>Name</u>	Gender	Relationship
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1.5.3 Mapping of 1-1 Relationship type

CUSTOMER

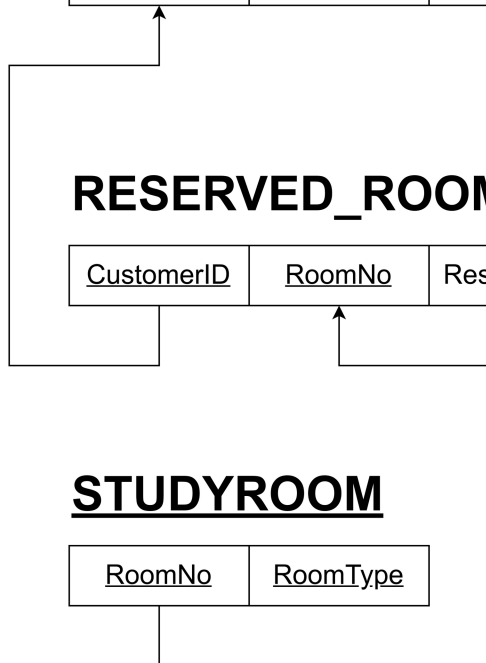
<u>ID</u>	FName	LName	DOB
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RESERVED_ROOM

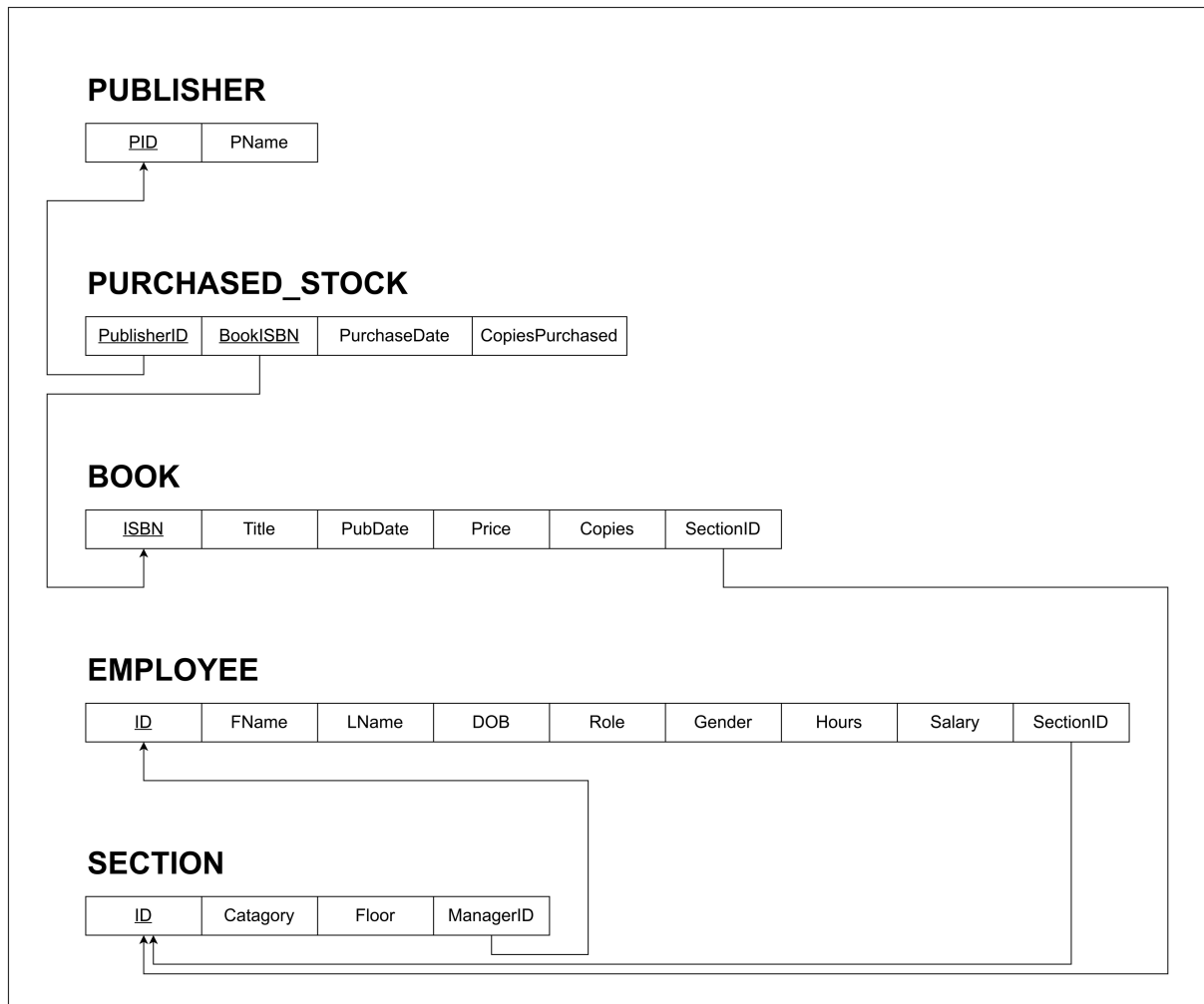
<u>CustomerID</u>	<u>RoomNo</u>	ResDuration	ReservationDate	ReservationTime
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STUDYROOM

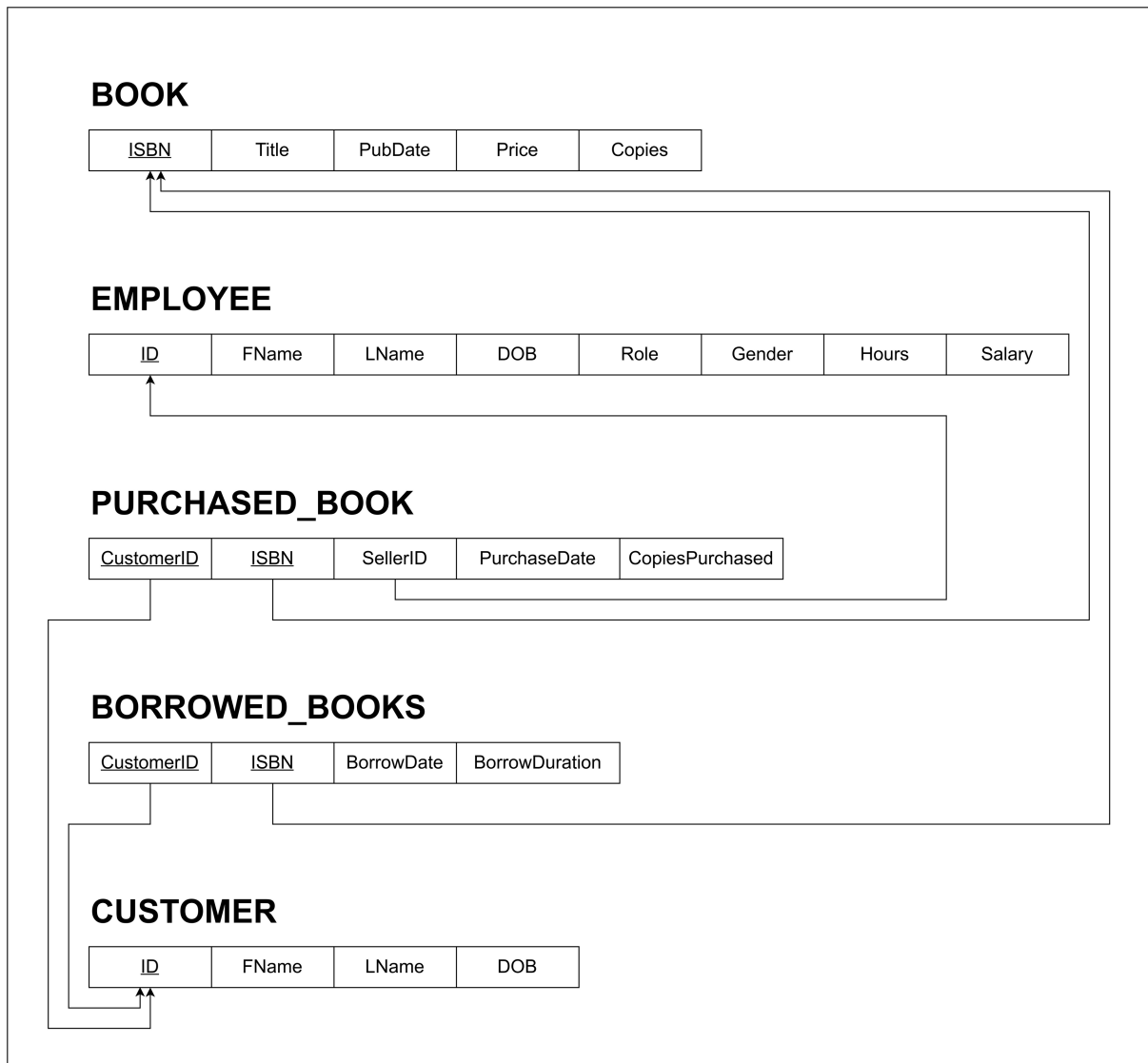
<u>RoomNo</u>	<u>RoomType</u>
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1.5.4 Mapping of 1-M Relationship type



1.5.5 Mapping of M-N Relationship type



1.5.6 Mapping of multivalued type

BOOK

<u>ISBN</u>	Title	PubDate	Price	Copies
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BOOK_AUTHOR

<u>ISBN</u>	<u>FName</u>	<u>MInitial</u>	<u>LName</u>
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CUSTOMER

<u>ID</u>	FName	LName	DOB
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CUSTOMER_CONTACT_INFO

<u>CuID</u>	<u>ContactInfo</u>
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