K. J. Somaiya College of Engineering, Mumbai-77
(Autonomous College Affiliated to University of Mumbai)

Batch: A2 Roll No.: 1911027
Experiment / assignment / tutorial No. 2
Grade: AA / AB / BB / BC / CC / CD /DD

Title: Mapping ER and EER Model to Relational Model

Objective: To apply mapping techniques to map ER diagram and EER to its equivalent relational model

Expected Outcome of Experiment:

CO 2: Convert entity-relationship diagrams into relational tables, populate a relational database and formulate SQL queries on the data Use SQL for creation and query the database.

Books/ Journals/ Websites referred:

G. K. Gupta :"*Database Management Systems*", McGraw – Hill

1. Korth, Slberchatz, Sudarshan : "Database Systems Concept", 6th Edition , McGraw Hill
2. Elmasri and Navathe, "Fundamentals *of Database Systems*", 5thEdition, PEARSON Education.

.

Relational Model

Relational Model represents the database as a collection of relations. Relational model can be thought of as table of values, each row in the table represents collection of related data values. In the relational model, each row in the table represents the fact that corresponds real world entity or relationship. The table name and column name are used to interpret the meanings of the values in each row.

In formal relational model terminology, a row is called tuple, a column header is called an attribute, and table is called a relation. The data type describing the types of values that can appear in each column is represented by a domain of possible values. Thus Relation is set of tuples.

Procedure for doing the Relation Model (ER to Relational Mapping)

1. **Mapping of Regular Entity**

   - For each regular (strong) entity type in the ER schema, create a relation R that includes all the simple attributes of E.
   - Choose one of the key attributes of E as the primary key for the relation

2. **Mapping of Weak Entity**

   - For each weak entity type W in the ER schema with owner entity type E, create a relation R and include all attributes of the weak entity as attributes of the new relation R.
   - Then, include the primary key of the owner entity as foreign key attributes of R
   - The primary key of R is the *combination of* the primary key(s) of the owner(s) and the partial key of the weak entity type W, if any.

3. Mapping of Binary 1:1 Relationship Types

- For each 1:1 relationship type identify the entities participating in the relationship. There are two possible approaches below:
- a) Foreign Key approach:

  Choose one of the relations and include a foreign key in one relation (S) which is the primary key of the other relation (T). It is better to choose an entity type with *total participation* in the relationship in the role of S.

- b) Merged relation option:

  An alternate mapping of a 1:1 relationship type is possible by merging the two entity types and the relationship into a single relation. This may be appropriate when *both participations are total.*

4. Mapping of Binary 1:N Relationship Types

- For each regular 1:N relationship type R, identify the relation S, which is the entity on the N-side of the relationship.
- Include as foreign key in S the primary key of the relation which is on the 1 side of the relationship
- Include any simple attributes of the 1:N relation type as attributes of S.

5. Mapping of Binary M:N Relationship Types

- For each M:N relationship type, *create a new relation* S to represent the relationship
- Include as foreign key attributes in S the primary keys of the entities on each side of the relationship; *the combination of the two primary keys will form the primary key* of S

- Also include any simple attributes of the M:N relationship type as attributes of S.

6. Mapping of Multivalued Attributes.

- For each multivalued attribute A, create a new relation. This relation will include an attribute corresponding to the multi-valued attribute, plus the primary key attribute of the relation that has the multi-valued attribute, K
- The primary key attribute of the relation is the foreign key representing the relationship between the entity and the multi-valued relation
- The primary key of R is the combination of A and K

7. Mapping of N-ary Relationship Types

- For each n-ary relationship type R, where n>2, create a new relation S to represent the relationship.
- Include as foreign key attributes in S the primary keys of the relations that represent the participating entities
- Also include any simple attributes of the n-ary relationship type as attributes of S

8. Options for Mapping Specialization or Generalization

- Convert each specialization with m subclasses $\{S_1, S_2,\ldots,S_m\}$ and generalized superclass C, where the attributes of C are $\{k,a_1,\ldots a_n\}$ and k is the (primary) key, into relational schemas using one of the four following options:

Option 8A: Multiple relations-Superclass and subclasses.

Option 8B: Multiple relations-Subclass relations only.

Option 8C: Single relation with one type attribute.

Option 8D: Single relation with multiple type attributes.

9. Mapping of Union Types (Categories).

- For mapping a category whose defining superclass have different keys, it is customary to specify a new key attribute, called a surrogate key, when creating a relation to correspond to the category.
- In the example below, create a relation OWNER to correspond to the OWNER category and include any attributes of the category in this relation. The primary key of the OWNER relation is the surrogate key, which we called OwnerId.

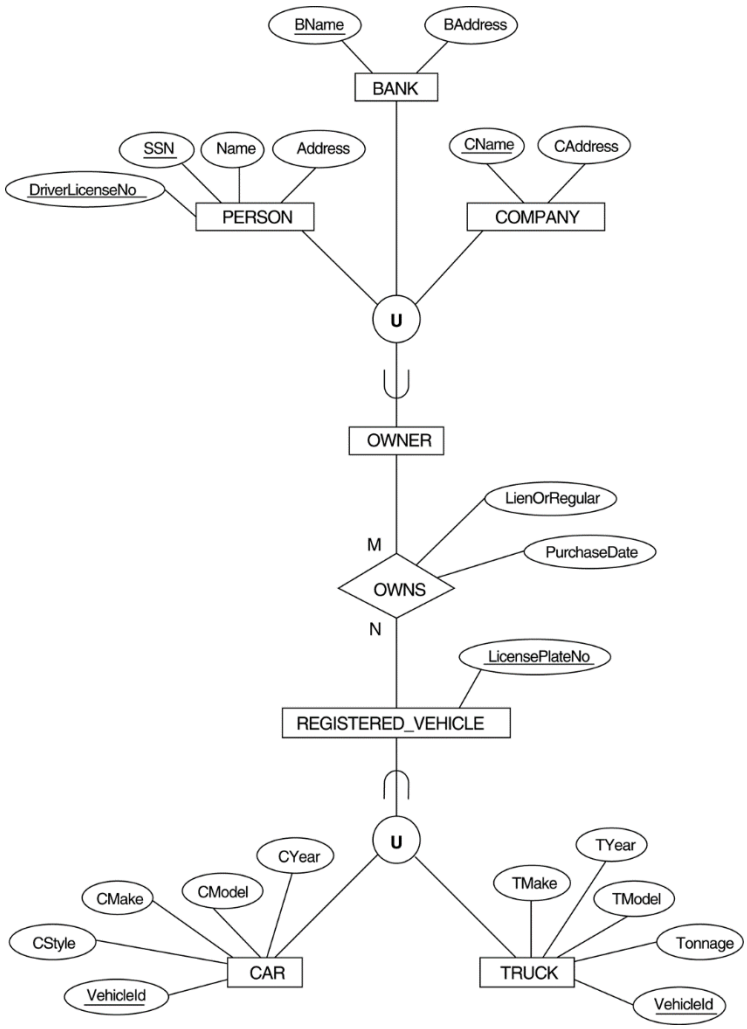


Figure 1: Two categories (union types): OWNER and REGISTERED_VEHICLE.

PERSON

SSN	DriverLicenseNo	Name	Address	

BANK

BName	BAddress	OwnerId

COMPANY

CName	CAddress	OwnerId

OWNER

OwnerId

REGISTERED_VEHICLE

VehicleId	LicensePlateNumber

CAR

VehicleId	CStyle	CMake	CModel	

TRUCK

VehicleId	TMake	TModel	Tonnage	TYear

OWNS

OwnerId	VehicleId	PurchaseDate	LienOrRegular

Figure 2: Mapping the EER categories (union types) in Figure 1 to relations.

Case Study considered for Database Design

`Problem Definition:` Now a days as technology is advancing in the healthcare sector so is the intensity and frequency of diseases. So the need for medicine is increasing at a non-linear rate, our pharma sector on the other side was struggling to cope with the accelerating need in the past. The scenario is different now and so is the problem. We currently have a good production rate of these medicines, but as we know as one problem is solved another is ready to make its way.
In this technological era we suppose things to be done as fast as possible.

Now consider a person who wants a particular medicine. He goes to some medical shops and inquires about the medicine, there is a good amount of chance that he might find the medicine without wasting much time roaming around 4-5 medical shops. If he finds the medicine in a medical shop say 'x' and the price is say 'a', and he purchases the medicine. And somewhere around him nearby there is another medical store that is providing the same medicine for a discounted rate. The person has not made an optimized purchase. But on the contrary if he does not find the medicine then what?

Another case being, if there are only senior citizens staying in a house then, how feasible it is for them to go and purchase medicine each time they need it?

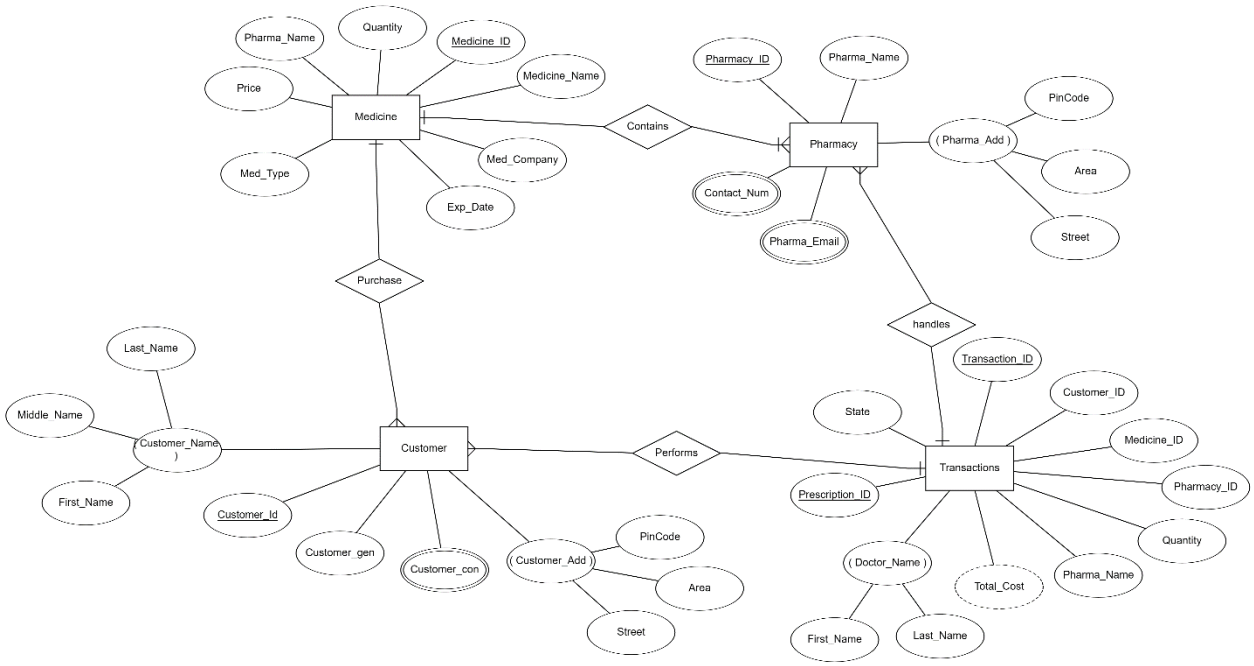
So therefore we came up with an idea to sell medicines and deliver it to a particular customer at his/her door step. The ideas goes like this, we first take information of a particular customer to store it into our database. We then gather a list of all the medicine shops (Mainly major ones to ensure availability of all medicines at any given time). Now our customer could order any medicine he wants through our portal. When he/she does so and searches for a particular medicine our system would first of all list all the medical shops that have this particular medicine available. After which our system would also recommend that particular medical which is providing the medicine at the least price thus giving our customer a better purchase.

There are many advantages of this type of systems like lower prices of medicines, availability of medicines i.e. if medicines are not available in one of the shops than it can be made available to the customer from another shop as well, price comparison of medicine is also possible.

There is no doubt that there are many advantages and benefits of online medicine delivery system but disadvantages are also there. There are many illiterate people who can’t do such things efficiently. There are many fake prescription related issues that are also present in the current scenario which would adversely affect the health of people. By ordering medicines online some additional costs are also added to the final amount.

K. J. Somaiya College of Engineering, Mumbai-77
(Autonomous College Affiliated to University of Mumbai)

Design of EER:



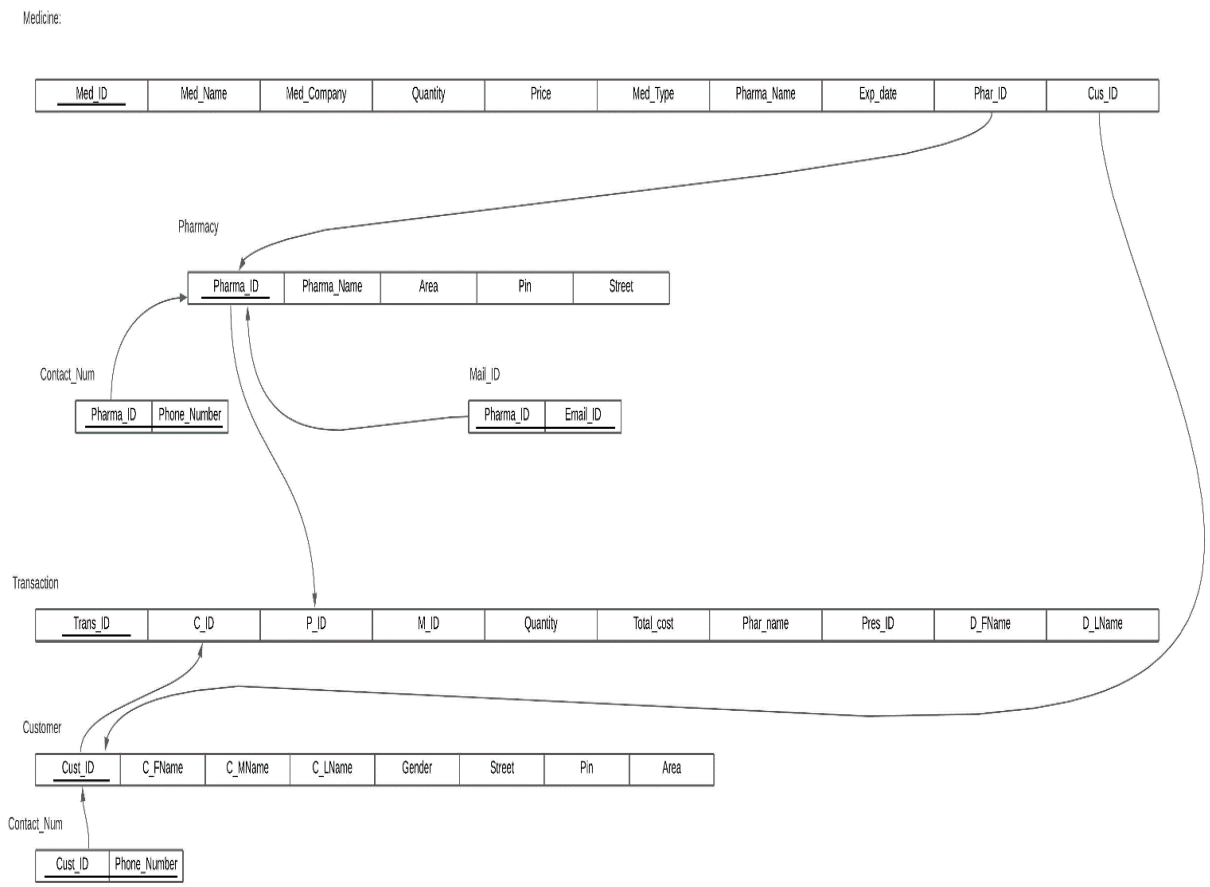
K. J. Somaiya College of Engineering, Mumbai-77
(Autonomous College Affiliated to University of Mumbai)

Relational Model for Project : -

Step 1 : - Identify all the regular entities i.e. Medicine , Pharmacy , Transactions and Customer and create a separate relation for that with all the attributes except multivalued attributes.

Step 2 : - Mapping all 1 : N relationships by adding primary key of 1 side as foreign key on N side. As Pharmacy (1) and Medicine(N) has 1:N relationship so adding pharmacy_id as foreign key in Medicine. Similarly we will do it for Customer(1) and Medicine(N), Customer(1) and Transactions(N), Pharmacy(1) and Transactions(N). And we will show this using arrows starting from foreign key and ending at primary key.

Step 3 : - As our pharmacy and customer table contains multivalued attributes so we will create a different relation for that and add the primary key of entity of which this multivalued attribute is a part of. Now for this newly created relation the multivalued attribute and primary key will form primary key.

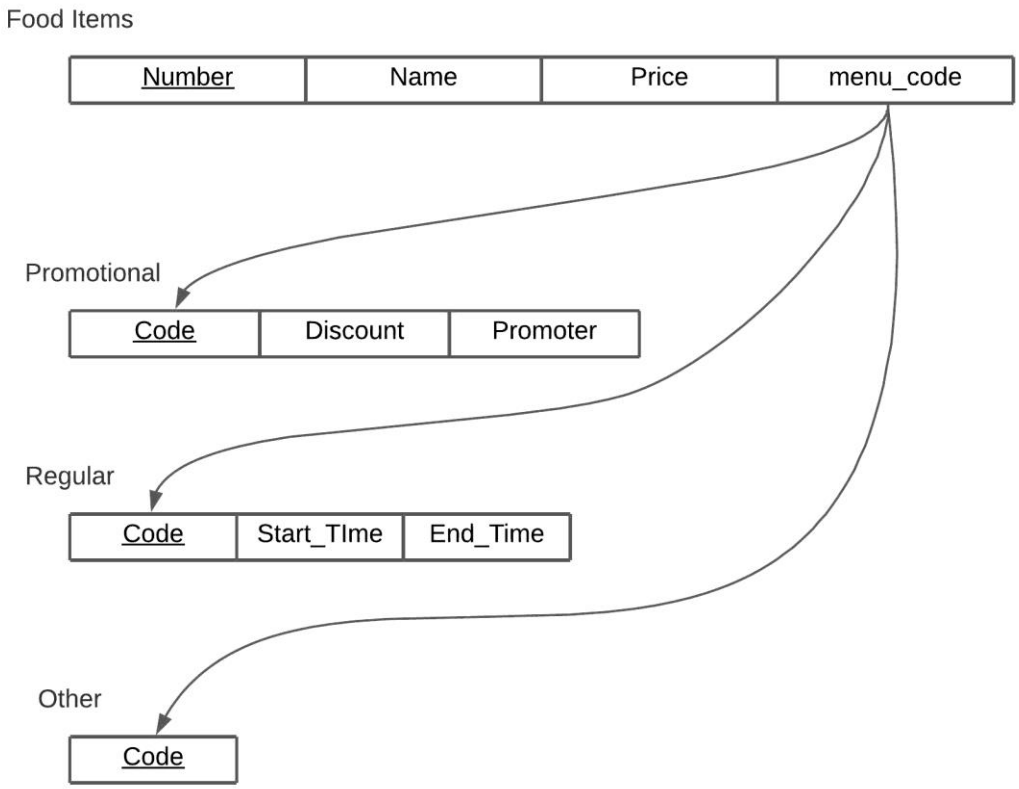


Conclusion: By performing this experiment we understood how to convert EER diagram to relational model by following various steps. Now it will be much easier to deploy this tables on MySQL.

Post Lab Questions:

1. Draw the MENU entity as a supertype of the PROMOTIONAL, REGULAR, and OTHER entities. The UID of MENU is code. MENU is related to FOOD ITEM through this relation-ship: each MENU may contain one or more FOOD ITEMs, and each FOOD ITEM must be listed on one and only one MENU. The UID of FOOD ITEM is a barred UID using its at-tribute "number". Add appropriate attributes to the each entity and draw a relational model for it

ANS)



2. **A field in a database table whose values are the same as the primary key of another table is called:**
   A. A foreign key
   B. A primary key
   C. A secondary key
   D. A candidate key
   E. An alternate key
   ANS) A. A foreign key

3. **The mapping of relationship depends on**
   A. Type of relationship
   B. No. of records
   C. No. of attributes
   D. No. of regular entities
   ANS) A. Type of relationship