Chapter 2

Entity Relationship Modeling

Topics to be covered:

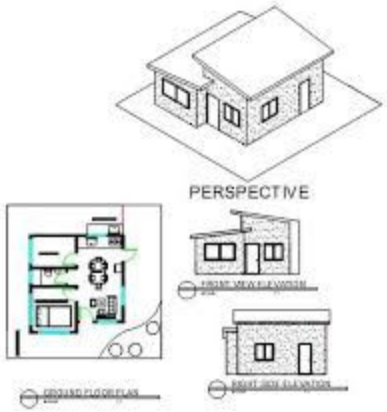
- **Quick Recap**
- Data Model
- ER Model
- Basic components of ER Model

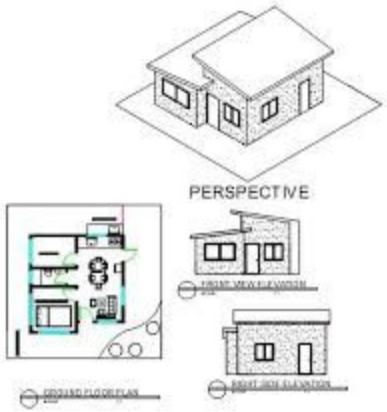
Learning Outcomes:

- Students should be able to:
- Describe concept of a data model
- Define Describe basic constructs of E-R Modeling
- Identify and provide suitable name that is descriptive of the relationship.

Quick Recap

- Data and Information
- Need of database
- File system v/s Database system
- Characteristics of databases
- Advantages and Disadvantages of databases
- Data abstraction
- Data Independence
- DBMS system architecture
- Database Users


PERSPECTIVE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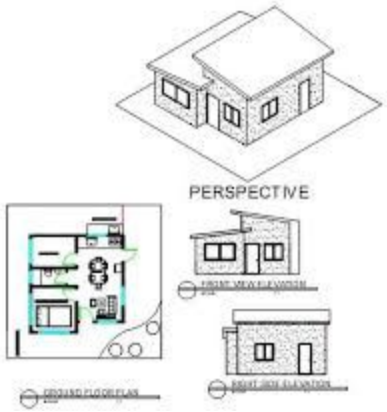

PERSPECTIVE


RJ Models

Data Models

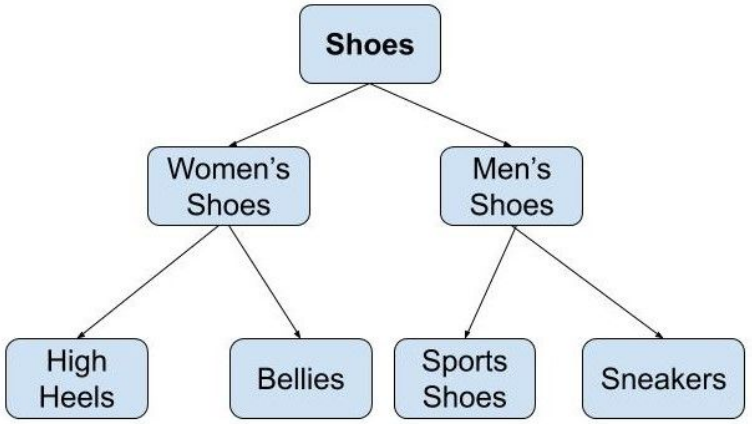
- Data Model gives us an idea that how the final system will look like after its complete implementation.
- It defines the data elements and the relationships between the data elements.
- Data Models are used to show how data is stored, connected, accessed and updated in the database management system.

Data Model Types

Data Model Types

Hierarchical Model

- organizes the data in the hierarchical tree structure.
- The hierarchy starts from the root which has root data and then it expands in the form of a tree adding child node to the parent node.
- Example: relationship between the shoes present on a shopping website



Hierarchical Model

Parent-Child Relationship Pointers
very simple and fast to traverse

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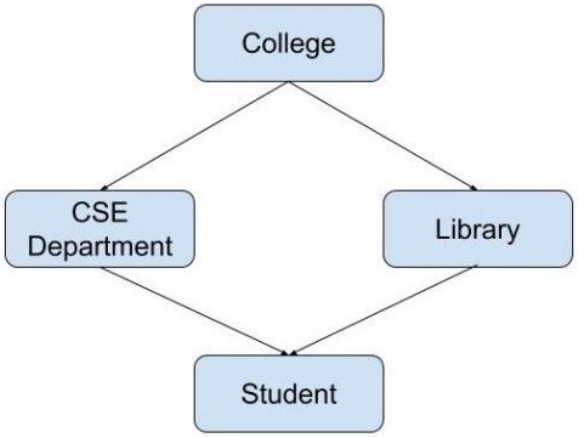
Complex relationships are not supported
Deletion Problem

Data Model Types

Network Model

- an extension of the hierarchical model.
- same as the hierarchical model, the only difference is that a record can have more than one parent
- Example: Node student has two parents i.e. CSE Department and Library



Network Model

Ability to Merge more Relationships
Many paths
This makes data access fast & simple

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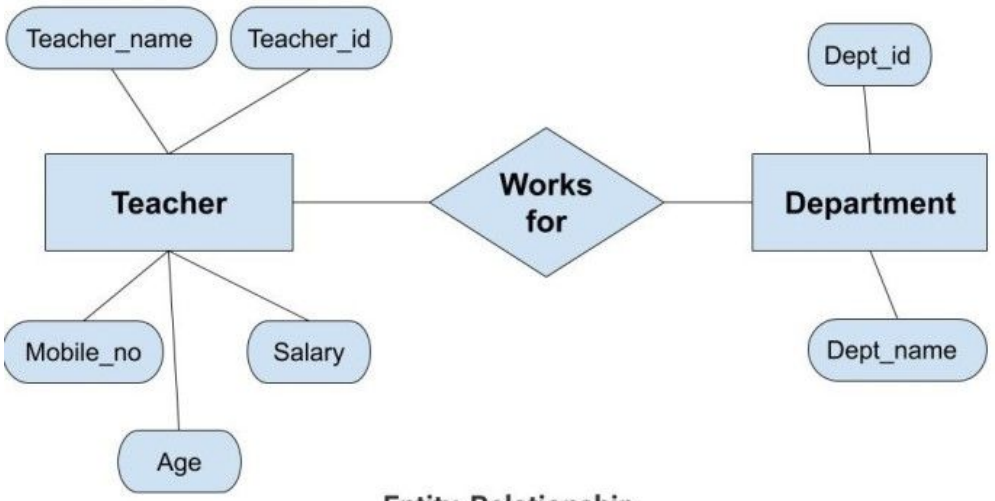
Any change like updation, deletion, insertion is very complex.

Data Model Types

Entity-Relationship Model

- is a high-level data model diagram
- represent the real-world problem in the pictorial form to make it easy for the stakeholders to understand
- also very easy for the developers to understand the system by just looking at the ER diagram
- Example: Teacher works for Departement



Entity-Relationship Model

Simple & Effective Communication Tool
Easy Conversion to any Model

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No industry standard for notation
Hidden information

Data Model Types

Relational Model

- is the most widely used model.
- the data is maintained in the form of a two-dimensional table.
- All the information is stored in the form of row and columns.
- The basic structure of a relational model is tables.
- So, the tables are also called relations in the relational model.
- Example: Employee table.

Emp_id	Emp_name	Job_name	Salary	Mobile_no	Dep_id	Project_id
AfterA001	John	Engineer	100000	9111037890	2	99
AfterA002	Adam	Analyst	50000	9587569214	3	100
AfterA003	Kande	Manager	890000	7895212355	2	65

EMPLOYEE TABLE

Tuples & Attribute or field
Simple & Scalable
Structural Independence

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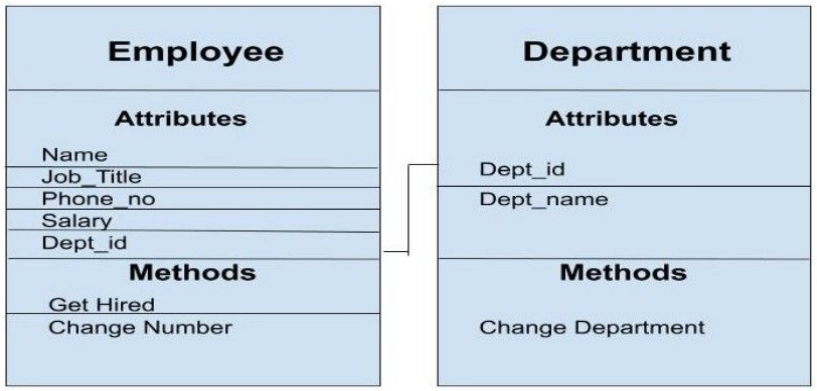
Hardware and Software cost
Bad Design

Data Model Types

Object Oriented data Model

- both the data and relationship are present in a single structure known as an object.
- We can store audio, video, images, etc in the database which was not possible in the relational model.
- two are more objects are connected through links.
- Example: Employee & Department



Object_Oriented_Model

Department_id and the communication between these two will be done with the help of this common id.

What is Conceptual Database Design?

- Process of describing the data, relationships between the data and the constraints on the data.
- After analysis - Gather all the essential data required and understand how the data are related
- The focus is on the *data*, rather than on the processes.
- The output of the conceptual database design is a **Conceptual Data Model** (+ *Data Dictionary*)

Gathering Information for Conceptual Data Modeling

- Two perspectives
  - Top-down

    Data model is derived from an intimate understanding of the business.
  - Bottom-up

    Data model is derived by reviewing specifications and business documents.

Entity-Relationship (ER) Modeling.

•1976 proposed by Peter Chen

•**ER Modeling** is a *top-down* approach to database design.

•ER diagram is widely used in database design

-Represent conceptual level of a database system

-Describe things and their relationships in high level

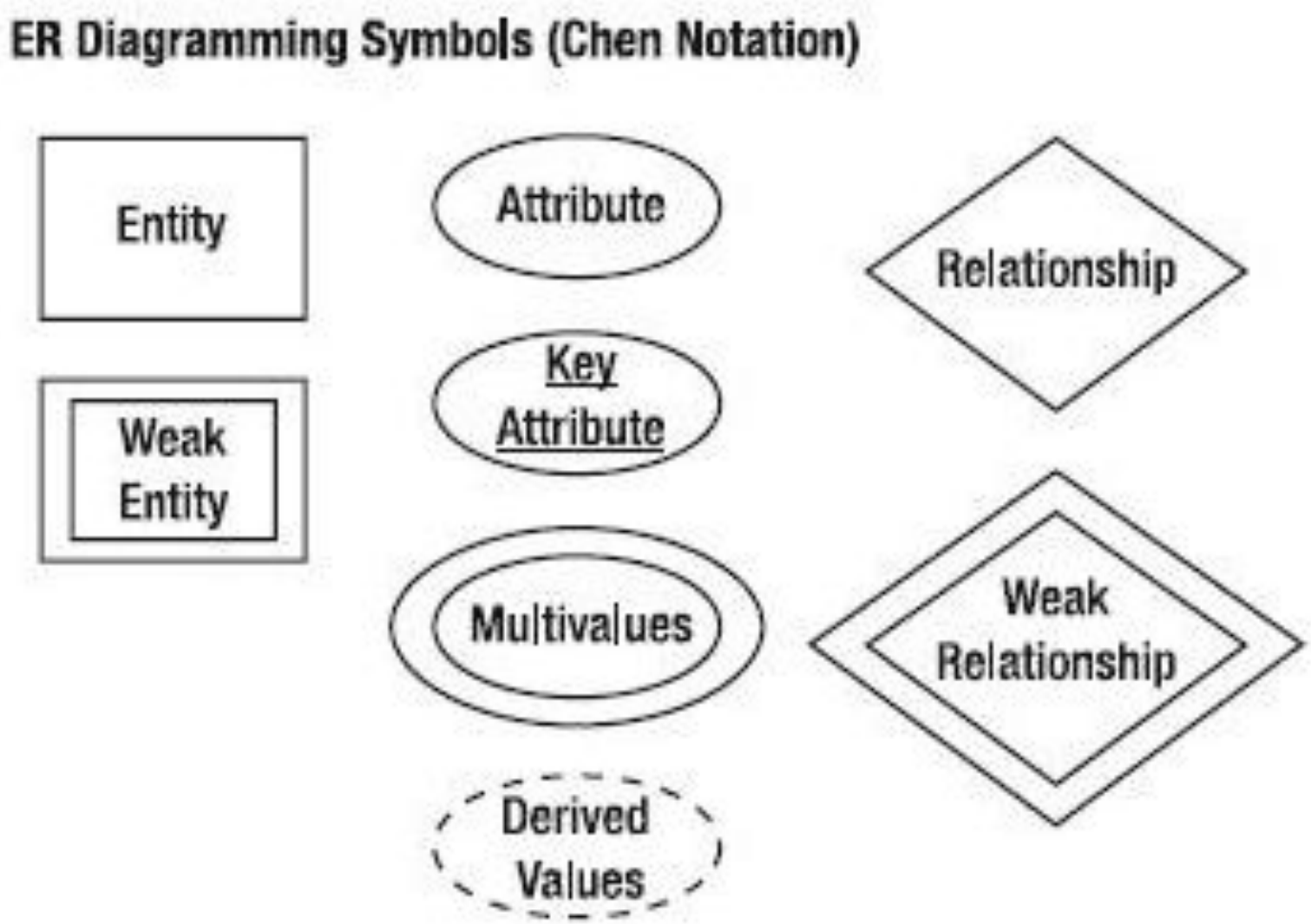
Three main constructs

Data entities

Relationships

Attributes

Chen Notation




EntityName
Verb Phrase
AttributeName
Entity
Relationship
Attribute

Person, place, object, event or concept about which data is to be maintained

Represents a set or collection of objects in the real world that share the same properties

Entities

Examples of entities:

- Person:
- Place:
- Object:
- Event:
- Concept:

Entities

Examples of entities:

- Person: EMPLOYEE, STUDENT, PATIENT
- Place: STORE, WAREHOUSE
- Object: MACHINE, PRODUCT, CAR
- Event: SALE,REGISTRATION, RENEWAL
- Concept: ACCOUNT

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Guidelines for naming and defining entity types:

- An entity type name is a singular noun
- An entity type should be descriptive and specific
- An entity name should be concise
- Use uppercase letters for entity type name

named property or characteristic of an entity

Attributes

Example of entity types and associated attributes:

STUDENT:

DOCTOR:

Attributes

Example of entity types and associated attributes:

STUDENT: Student_ID, Student_Name, Home_Address, Phone_Number, Major

DOCTOR: Doc_ID, Tel, Qualification, Address, Experience

Attributes

Example of entity types and associated attributes:

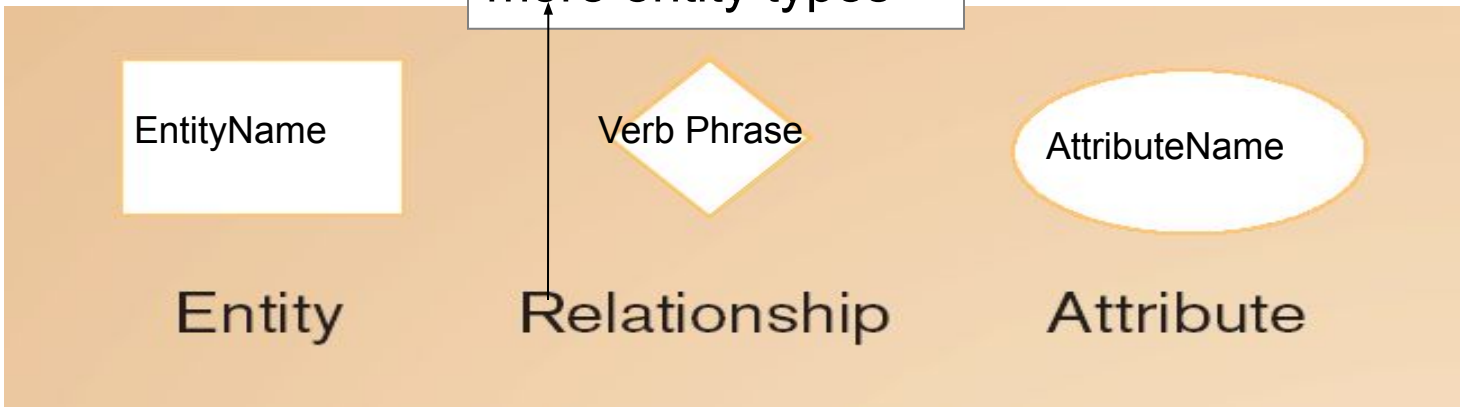
STUDENT: Student_ID, Student_Name, Home_Address, Phone_Number, Major

DOCTOR: Doc_ID, Tel, Qualification, Address, Experience

Guidelines for naming attributes:

- An attribute name is a adjective/noun.
- An attribute name should be unique
- Similar attributes of different entity types should use similar but distinguishing names.
- attributes names, initial letter capitalized

Association between the instances of one or more entity types



Relationships

- Associations between instances of one or more entity types that is of interest
- Given a name that describes its function.
  - relationship name is an active or a passive verb.

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AUTHOR

BOOK

Relationships

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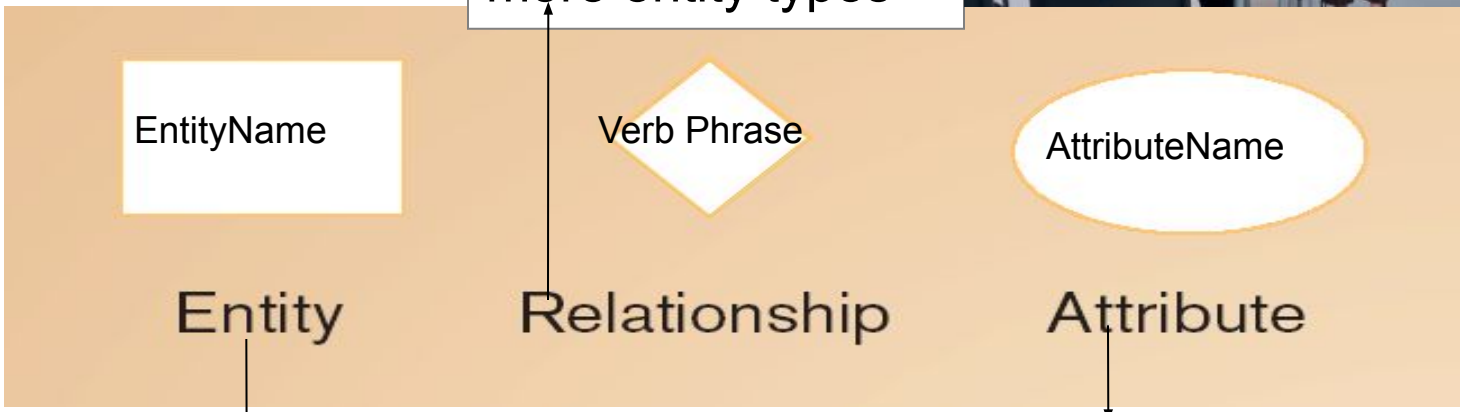
Relationship name:
writes

AUTHOR

BOOK

An author writes one or more books
A book can be written by one or more authors.

Association between the instances of one or more entity types



Person, place, object, event or concept about which data is to be maintained

named property or characteristic of an entity

Represents a set or collection of objects in the real world that share the same properties

QUIZ

1. Which of the following is a Data Model?

A. Entity-Relationship model
B. Relational data model
C. Object-Based data model
D. All of the above

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2. Logical design of database is called

A. Database Instance
B. Database Snapshot
C. Database Schema
D. All of the above

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QUIZ

4. _____ is a classical approach to database design?

A. Left – Right approach
B. Right – Left approach
C. Top – Down approach
D. Bottom – Up approach

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5. **MCQ**: In database management system, the term which is used to represent the real world concept or object is classified as

   A. entity
   B. attribute
   C. relationship
   D. abstraction

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6. Association among several entities is called as _____.

A. Relationship
B. Association
C. Combination
D. Extraction

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QUIZ

7. Collection of tables to represent both data and relationship is described by _____.

A. Relational Model
B. Network Model
C. Entity Model
D. Entity Relation Model

QUIZ

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QUIZ

8. What is statement explains the Relational Data Model?

A. Within a table, rows and columns are used to arrange the data.
B. As data, objects, and relationships among them are represented logically in this model.
C. Functions, encapsulation, and object identity are also considered in addition to the ER model.
D. These data models facilitate data specifications where different attributes are defined for the same data items of the same type.

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QUIZ

9. What is TRUE about Relational Data Model?

A. Tables are used in relational models to represent data and the relationships between them.
B. Edgar F. Codd presented this model in 1969.
C. Most commercial data processing applications use the relational data model.
D. All of the above

QUIZ

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QUIZ

10. _____ are collections of similar types of entities.

A. Relationship Set
B. Entity Set
C. ER Set
D. None of the above

QUIZ

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QUIZ

11. Which of the following is NOT a basic element of all versions of the E-R model?

- Entities
- Attributes
- Relationships
- Primary keys

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QUIZ

12. **Entities can be associated with one another in which of the following?**

- ○ Entities
- ○ Attributes
- ○ Identifiers
- ○ Relationships

QUIZ

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QUIZ

13. All instances of an entity class have the same attributes.

- ○ True
- ○ False

QUIZ

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QUIZ

14. An attribute describes the entity's characteristics.

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QUIZ

15. . An entity is something that can be identified in the user's work environment; something that the users want to track.

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QUIZ

16. What is TRUE about Logical Data Independence?

A. We wouldn't impact the user view of the data if we changed the conceptual view of the data.
B. User interfaces are logically independent of data.
C. Both A and B
D. None of the above

QUIZ

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QUIZ

17. Identify entities and attributes for hospital management system

QUIZ

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Hospital Management System entities and their attributes :

- **Hospitals Entity** : Attributes of Hospitals are hospital_id, hospital_doctor_id, hospital_name, hospital_place, hospital_type, hospital_description, hospital_address
- **Patient Entity** : Attributes of Patient are patient_id, patient_name, patient_mobile, patient_email, patient_username, patient_password, patient_address, patient_blood_group
- **Doctors Entity** : Attributes of Doctors are doctor_id, doctor_name, doctor_specialist, doctor_mobile, doctor_email, doctor_username, doctor_password, doctor_address
- **Nurses Entity** : Attributes of Nurses are nurse_id, nurse_name, nurse_duty_hour, nurse_mobile, nurse_email, nurse_username, nurse_password, nurse_address,
- **Appointments Entity** : Attributes of Appointments are appointment_id, appointment_doctor_id, appointment_number, appointment_type, appointment_date, appointment_description
- **Medicines Entity** : Attributes of Medicines are medicine_id, medicine_name, medicine_company, medicine_composition, medicine_cost, medicine_type, medicine_dose, medicine_description

QUIZ

18. **E-R diagram of the relationship between doctors and patients.**

QUIZ

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Entities:
DOCTOR
PATIENT

Relationship:
Prescribing_medicine

QUIZ

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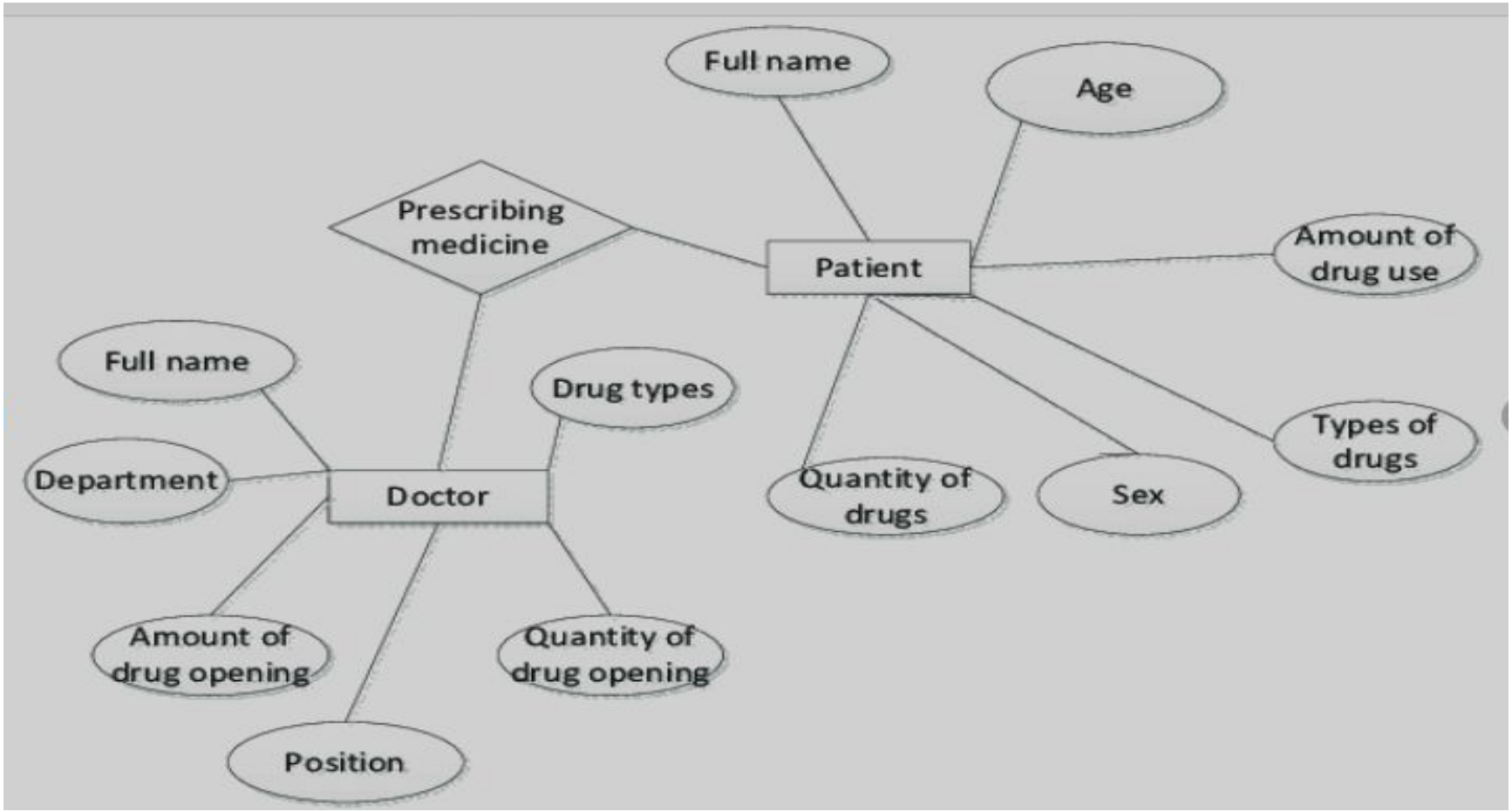

Thank You