Chapter 7

Methodology
Conceptual Databases Design
Transparencies

Chapter 7 - Objectives

- **The purpose of a design methodology.**
- **Database design has three main phases: conceptual, logical, and physical design.**
- **How to decompose the scope of the design into specific users' views of the enterprise.**

Chapter 7 - Objectives

- **How to use Entity–Relationship (ER) modeling to build a local conceptual data model based on the information given in a user's view of an enterprise.**
- **How to ensure that the resultant conceptual model is a true and accurate representation of a user's view of an enterprise.**
- **How to document the process of conceptual database design.**

Review of Conceptual/Logical/Physical Database Design

- **CONCEPTUAL: The process of constructing a model of the information used in an enterprise, independent of *all* physical considerations.**
- **LOGICAL: The process of constructing a model of the information used in an enterprise based on a specific data model (e.g. relational), but independent of a particular DBMS and other physical considerations.**

Review of Conceptual/Logical/Physical Database Design

- **PHYSICAL: The process of producing a description of the implementation of the database on secondary storage; it describes the storage structures and access methods used to achieve efficient access to the data.**

Critical Success Factors in Database Design

- **Work interactively with the users as much as possible.**
- **Follow a structured methodology throughout the data modeling process.**
- **Employ a data-driven approach.**
- **Incorporate structural and integrity considerations into the data models.**
- **Combine conceptualization, normalization, and transaction validation techniques into the data modeling methodology.**

Critical Success Factors in Database Design

- Use diagrams to represent as much of the data models as possible.
- Use a Database Design Language (DBDL) to represent additional data semantics.
- Build a data dictionary to supplement the data model diagrams.
- Be willing to repeat steps.

Methodology Overview - Conceptual Database Design

- Step 1 Build local conceptual data model for each user view
  - Step 1.1 Identify entity types
  - Step 1.2 Identify relationship types
  - Step 1.3 Identify and associate attributes with entity or relationship types
  - Step 1.4 Determine attribute domains
  - Step 1.5 Determine candidate and primary key attributes
  - Step 1.6 Specialize/generalize entity types (optional step)
  - Step 1.7 Draw Entity–Relationship diagram
  - Step 1.8 Review Local Conceptual Data Model with User

Overview - Logical and Physical Database Design for Relational Model

- **Step 2 Build and Validate Local Logical Data Model**
- **Step 3 Build and Validate Global Logical Data Model**
- **Step 4 Translate Global Logical Data Model for Target DBMS**
- **Step 5 Design Physical Representation**
- **Step 6 Design and Implement Security Mechanisms**
  - **Step 6.1 Design User Views**
  - **Step 6.2 Design Access Rules**
- **Step 7 Monitor and Tune the Operational System**

Step 1 Build Local Conceptual Data Model from User View

- **To build a local conceptual data model of an enterprise for a specific user view.**
- **Step 1.1 Identify Entity Types**
  - **To identify and document the main entity types in the user's view of the enterprise.**
- **Step 1.2 Identify Relationship Types**
  - **To identify and document the important relationships that exist between the entity types that we have identified.**

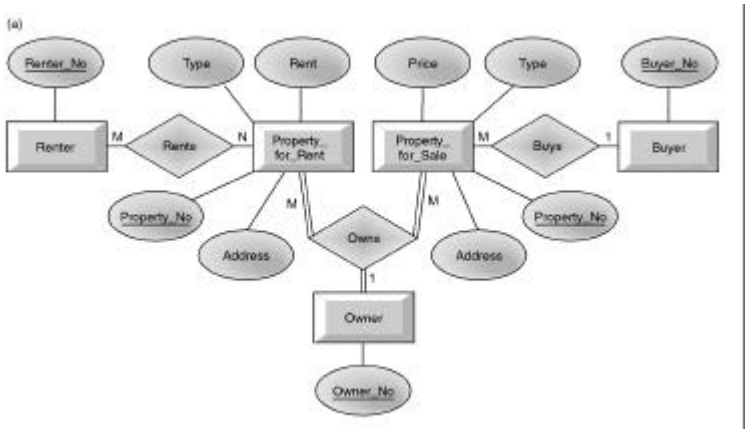
Step 1 Build Local Conceptual Data Model from User View

- **Step 1.3 Identify and Associate Attributes with Entity or Relationship Types**
  - **To identify and associate attributes with the appropriate entity or relationship types and document the details of each attribute.**
- **Step 1.4 Determine Attribute Domains**
  - **To determine domains for the attributes in the local conceptual model and document the details of each domain.**

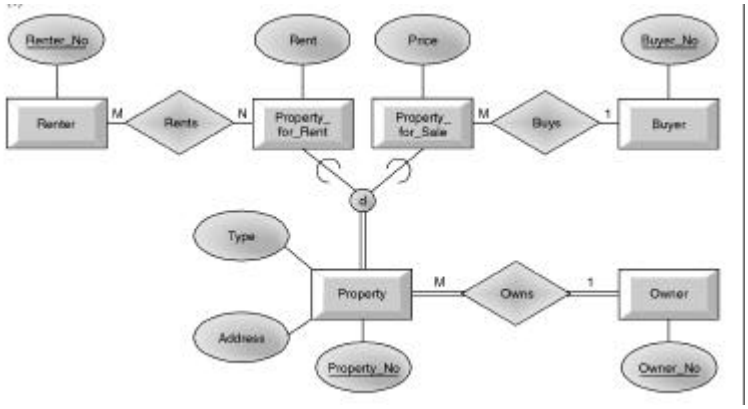
Step 1 Build Local Conceptual Data Model from User View

- **Step 1.5 Determine Candidate and Primary Key Attributes**
  - **To identify the candidate key(s) for each entity and if there is more than one candidate key, to choose one to be the primary key.**
- **Step 1.6 Specialize / Generalize Entity Types (Optional Step)**
  - **To identify superclass and subclass entity types, where appropriate.**

Step 1.6 Specialize / Generalize Entity Types (Optional Step)



Step 1.6 Specialize / Generalize Entity Types (Optional Step)



Step 1 Build Local Conceptual Data Model from User View

- **Step 1.7 Draw Entity-Relationship Diagram**
  - **To draw an Entity-Relationship (ER) diagram that is a conceptual representation of a user view of the enterprise.**
- **Step1.8 Review Local Conceptual Data Model with User**
  - **To review the local conceptual data model with the user to ensure that the model is a 'true' representation of the user's view of the enterprise.**