Systems Analysis and design - 2

Slide Adapted from:

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(Modern Systems Analysis and Design, 7th Edition, **Pearson Prentice Hall)**

Chapter 9

Designing Databases

Learning Objectives

- ✓ Concisely define each of the following key database design terms: relation, primary key, normalization, functional dependency, foreign key, referential integrity, field, data type, null value, denormalization, file organization, index, and secondary key.
- ✓ Explain the role of designing databases in the analysis and design of an information system.
- ✓ Transform an entity-relationship (E-R) diagram into an equivalent set of well-structured (normalized) relations.

Learning Objectives (Cont.)

- ✓ Merge normalized relations from separate user views into a consolidated set of well-structured relations.
- ✓ Choose storage formats for fields in database tables.
- ✓ Translate well-structured relations into efficient database tables.
- ✓ Explain when to use different types of file organizations to store computer files.
- ✓ Describe the purpose of indexes and the important considerations in selecting attributes to be indexed.

Introduction

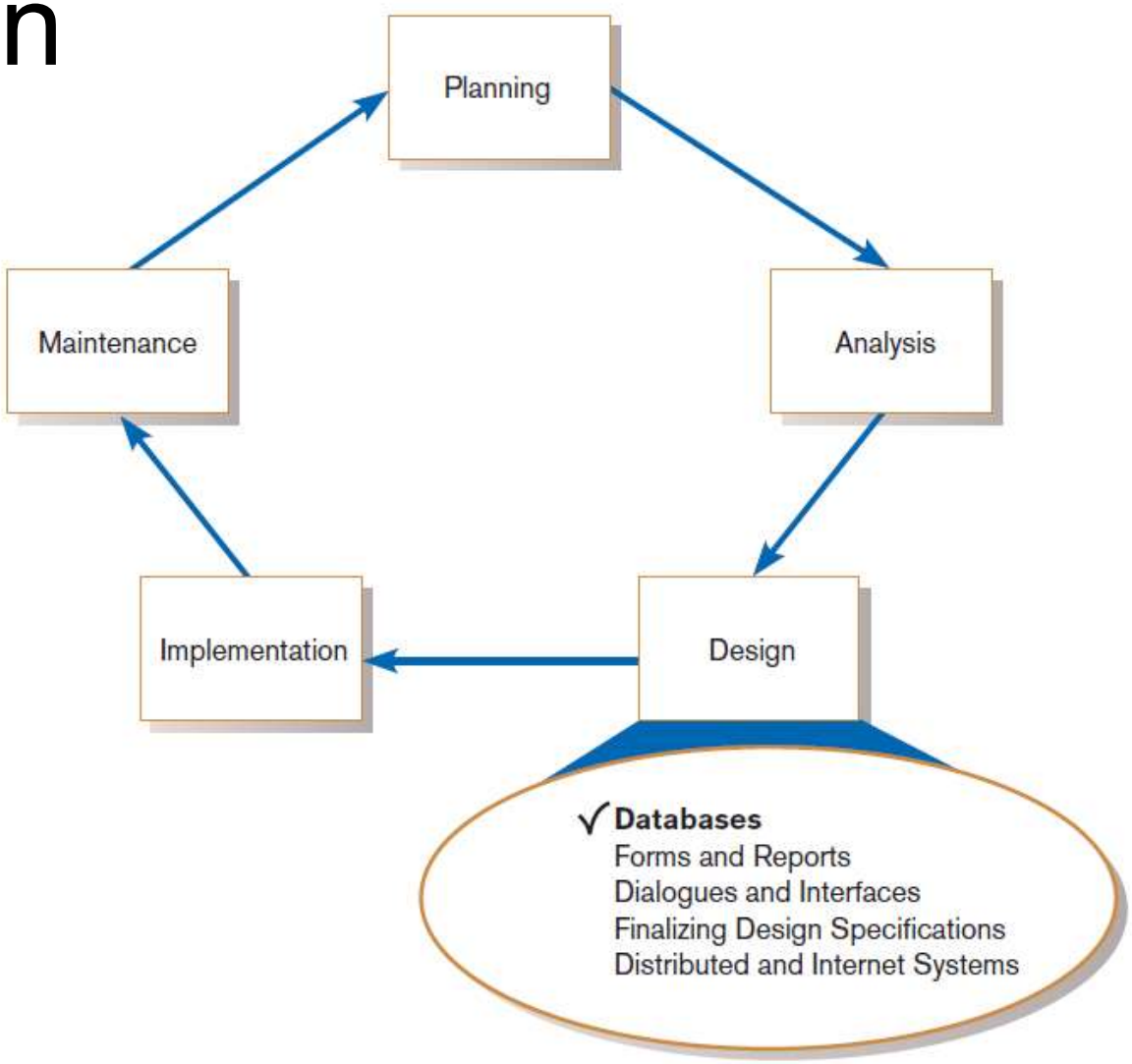

FIGURE 9-1
Systems development life cycle with design phase highlighted

Database Design

- File and database design occurs in two steps.
  1. Develop a logical database model, which describes data using notation that corresponds to a data organization used by a database management system.
     - Relational database model
  2. Prescribe the technical specifications for computer files and databases in which to store the data.
     - Physical database design provides specifications
- Logical and physical database design in parallel with other system design steps

The Process of Database Design

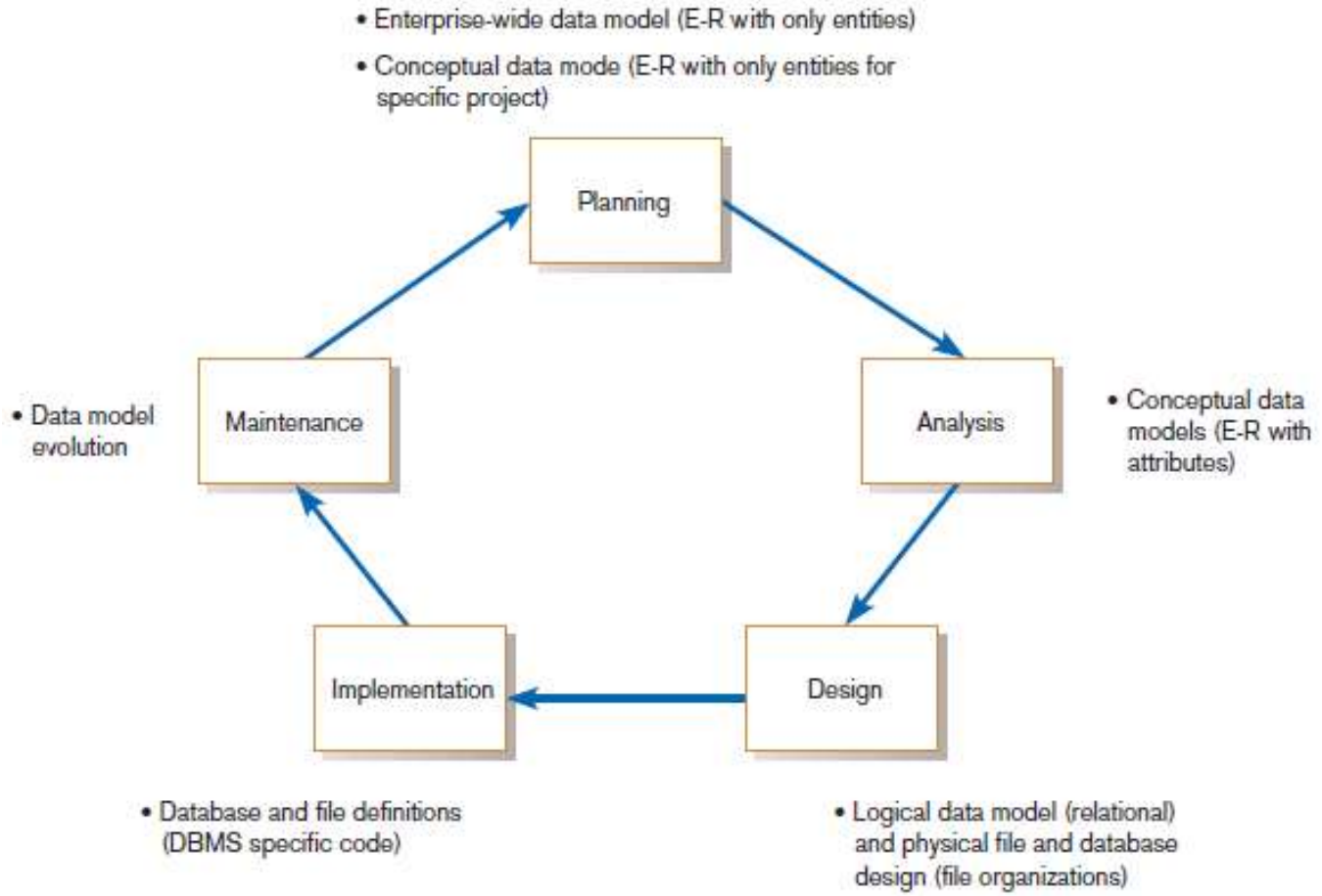

FIGURE 9-2
Relationship between data modeling and the systems development life cycle

The Process of Database Design (Cont.)

- Four key steps in logical database modeling and design:
  1. Develop a logical data model for each known user interface for the application using normalization principles.
  2. Combine normalized data requirements from all user interfaces into one consolidated logical database model (view integration).
  3. Translate the conceptual E-R data model for the application into normalized data requirements.
  4. Compare the consolidated logical database design with the translated E-R model and produce one final logical database model for the application.

Physical Database Design

- Key physical database design decisions include:
  - Choosing a storage format for each attribute from the logical database model.
  - Grouping attributes from the logical database model into physical records.
  - Arranging related records in secondary memory (hard disks and magnetic tapes) so that records can be stored, retrieved and updated rapidly.
  - Selecting media and structures for storing data to make access more efficient.

Deliverables and Outcomes

- Logical database design
  - Must account for every data element on a system input or output
    - Normalized relations are the primary deliverable.
- Physical database design
  - Converts relations into database tables
    - Programmers and database analysts code the definitions of the database.
    - Written in Structured Query Language (SQL)

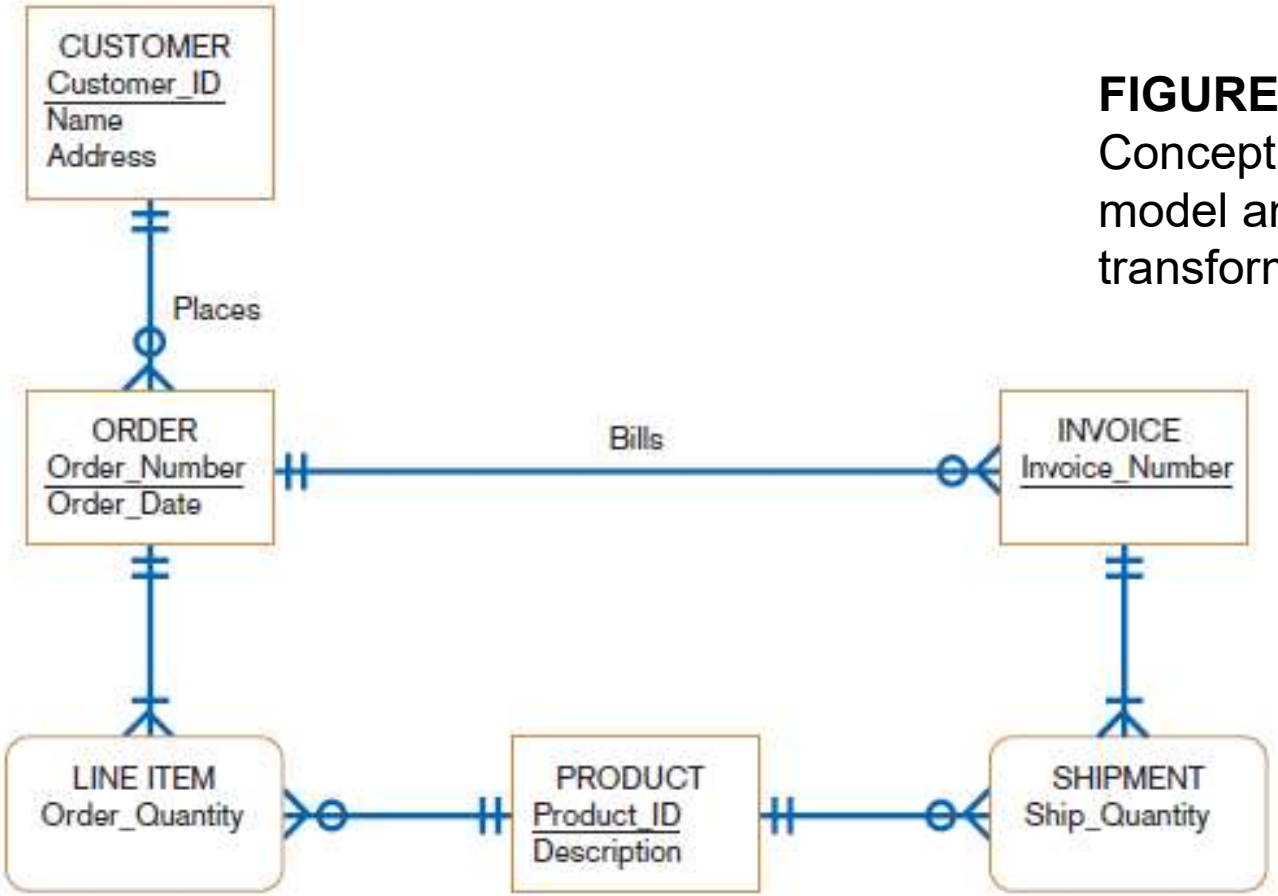

FIGURE 9-3 (d) Conceptual data model and transformed relations

Relations:

CUSTOMER(Customer_ID,Name,Address)
PRODUCT(Product_ID,Description)
ORDER(Order_Number,Customer_ID,Order_Date)
LINE ITEM(Order_Number,Product_ID,Order_Quantity)
INVOICE(Invoice_Number,Order_Number)
SHIPMENT(Invoice_Number,Product_ID,Ship_Quantity)

Summary (Cont.)

- ✓ Merge normalized relations from separate user views into a consolidated set of well-structured relations.
- ✓ Choose storage formats for fields in database tables.
- ✓ Translate well-structured relations into efficient database tables.
- ✓ Explain when to use different types of file organizations to store computer files.
- ✓ Describe the purpose of indexes and the important considerations in selecting attributes to be indexed.