

# Database Design

# Database Design

- **Databases**
  - part of a larger picture called an Information System (IS).
- Proper Database design is a critically important.
- **Managers want the database to serve their management needs**, but too many databases seem to force managers to alter their routines to fit the database requirements.
- **Systems analysis determines** the requirements and establish the domain/limits for an information system.
- **System Development** process **creates** information system.

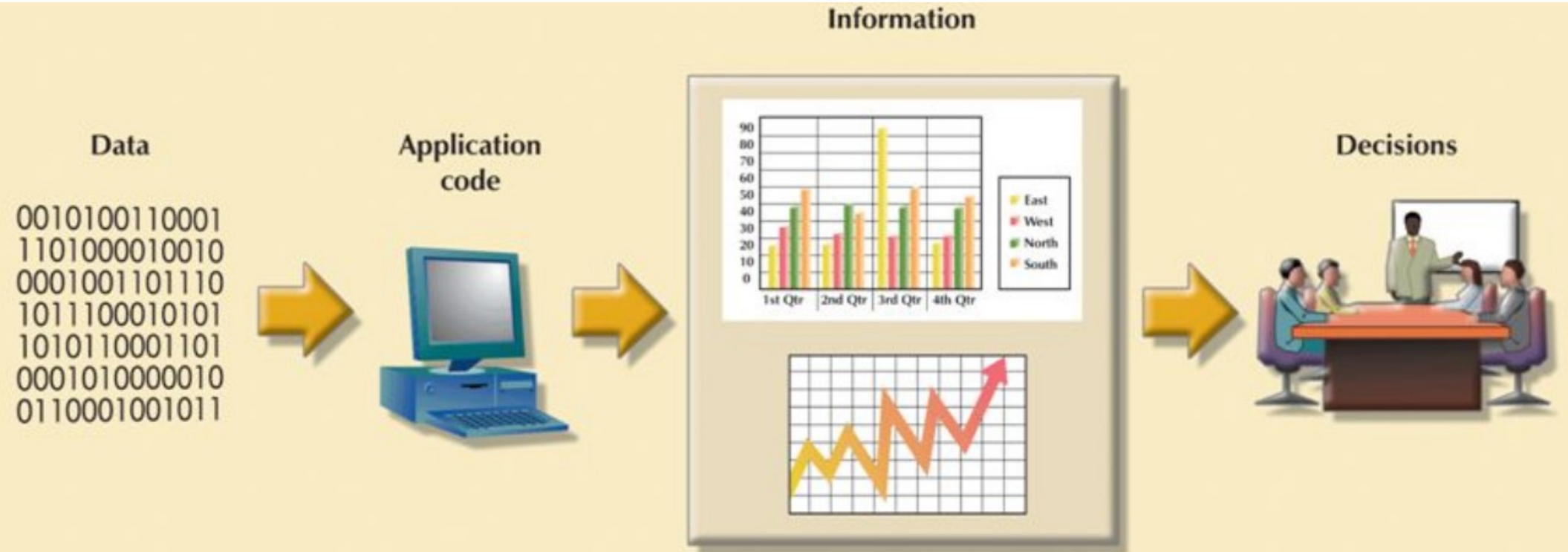
# Database Design

- Systems Development Life Cycle (SDLC)
  - **Iterative** pattern for IS development.
  - continuous process:
    - Creation,
    - maintenance,
    - enhancement, and
    - replacement of the IS.
- Database Life Cycle (DBLC):
  - Cyclic process: created, maintained, enhanced, and eventually replaced.

# Information System

- Provides for data collection, storage, and retrieval
- Composed of people, hardware, software, database(s), application programs, and procedures
- Systems analysis
  - Process that establishes need for and extent of information system
- Systems development
  - Process of creating information system

# Information System



Generating Information for Decision Making

# Information System

- Applications
  - Transform data into information that forms basis for decision making
  - Usually produce the following:
    - Formal report
    - Tabulations
    - Graphic displays
  - Composed of following two parts:
    - Data
    - Code by which data are transformed into information

# Information System

- Information system performance depends on triad of factors:
  - Database design and implementation
  - Application design and implementation
  - Administrative procedures
- Database development
  - Process of database design and implementation
  - Primary objective is to create complete, normalized, nonredundant (to the extent possible), and fully integrated conceptual, logical, and physical database models

# SDLC

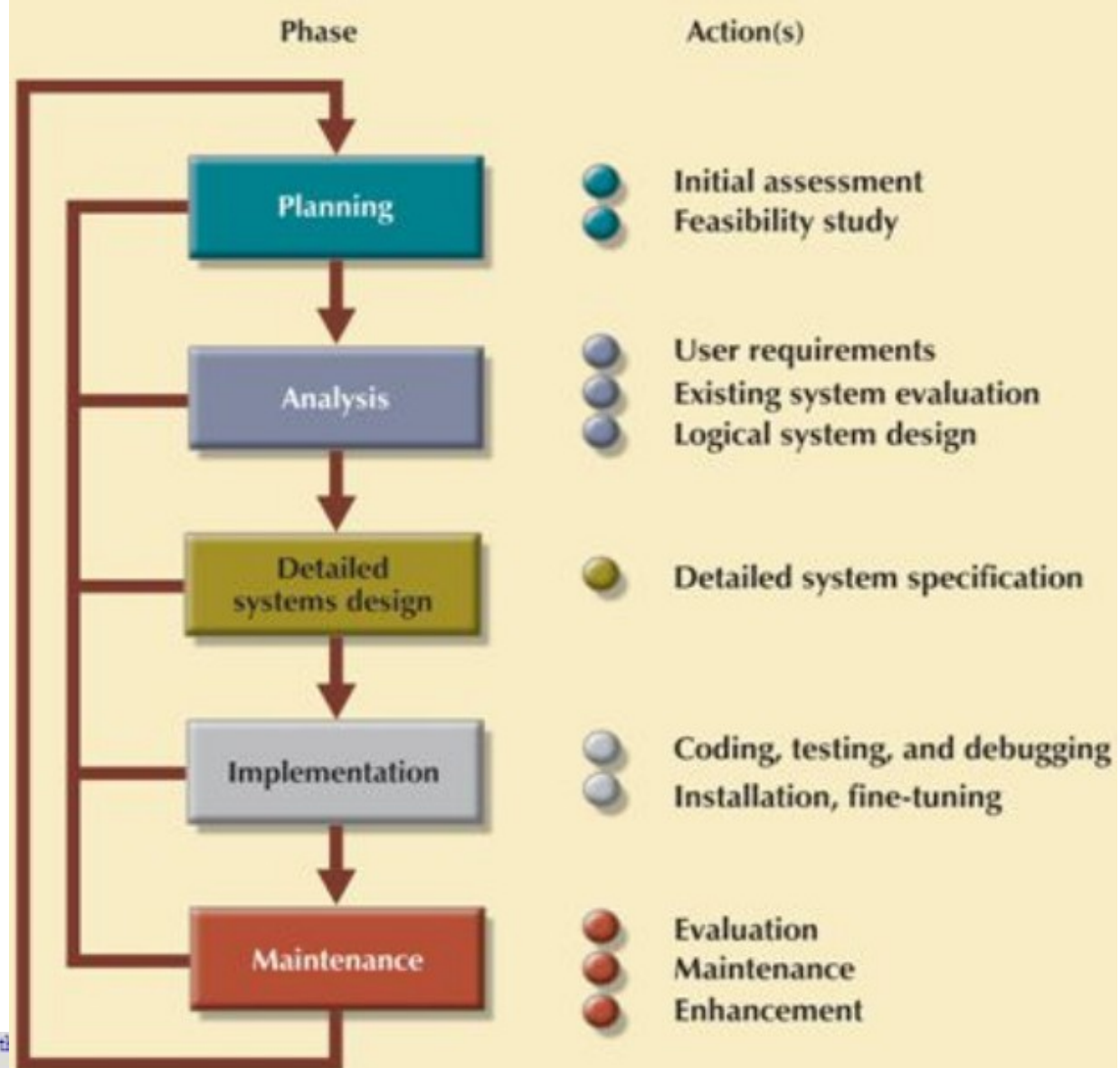
- Traces history (life cycle) of information system
- Provides “big picture” within which database design and application development can be mapped out and evaluated



# SDLC

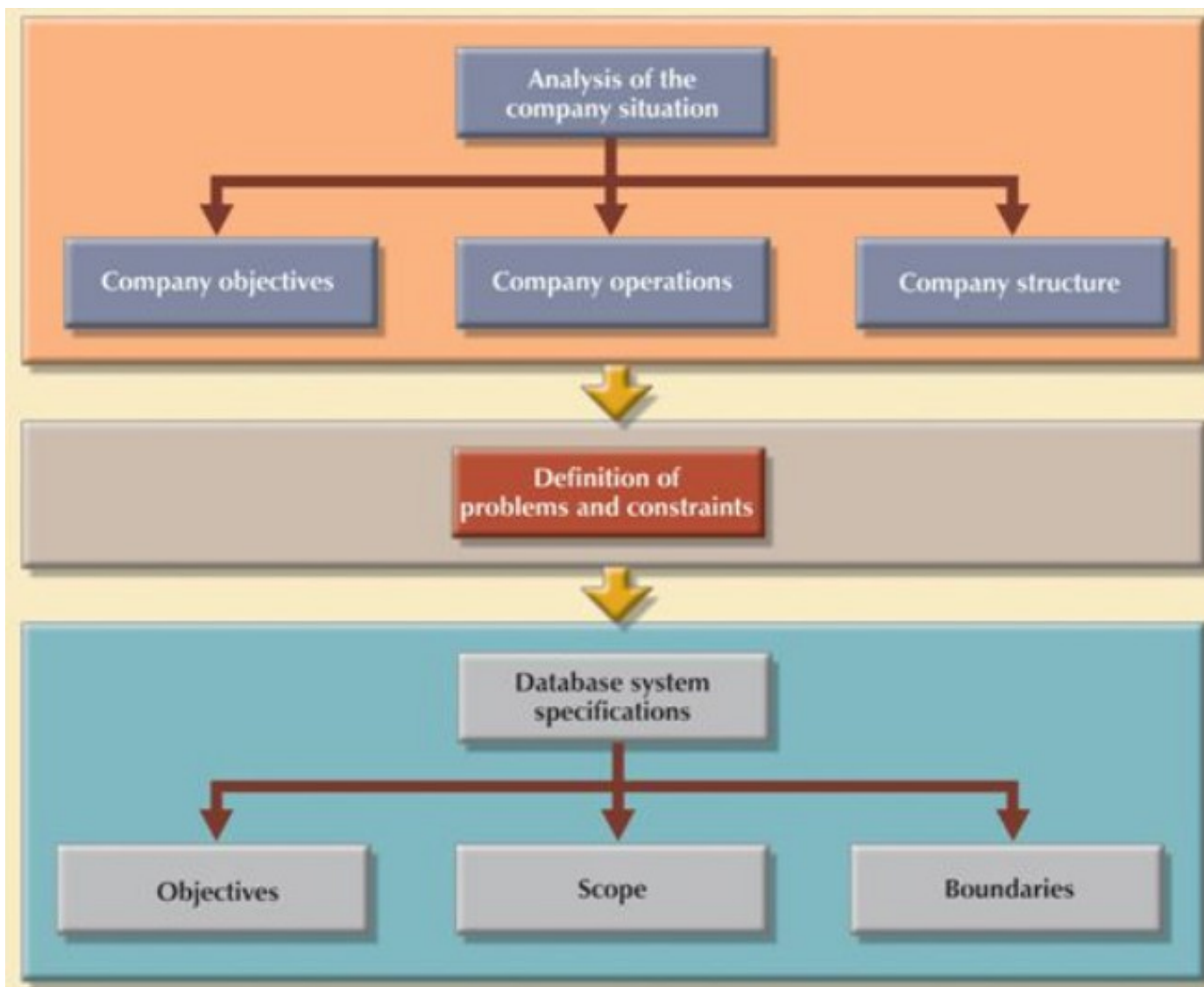
- Divided into following five phases:
  - Planning Feasibility study, hardware/software needs, system cost
  - Analysis Identified: functional and non functional requirements,  
Logical design created: ER Model, DFD, etc.
  - Detailed systems design Finalize technical specification
  - Implementation Database design is implemented  
Cycle of coding, testing, debugging
  - Maintenance Database is created ( tables, views, user authorizations)  
Correct system errors, adapt to changes, enhance the system.
- Iterative rather than sequential process

# SDLC



# Database Initial Study

- Overall purpose:
  - Analyze company situation
  - Define problems and constraints
  - Define objectives
  - Define scope and boundaries
- Interactive and iterative processes required to complete first phase of DBLC successfully



# Define Objectives

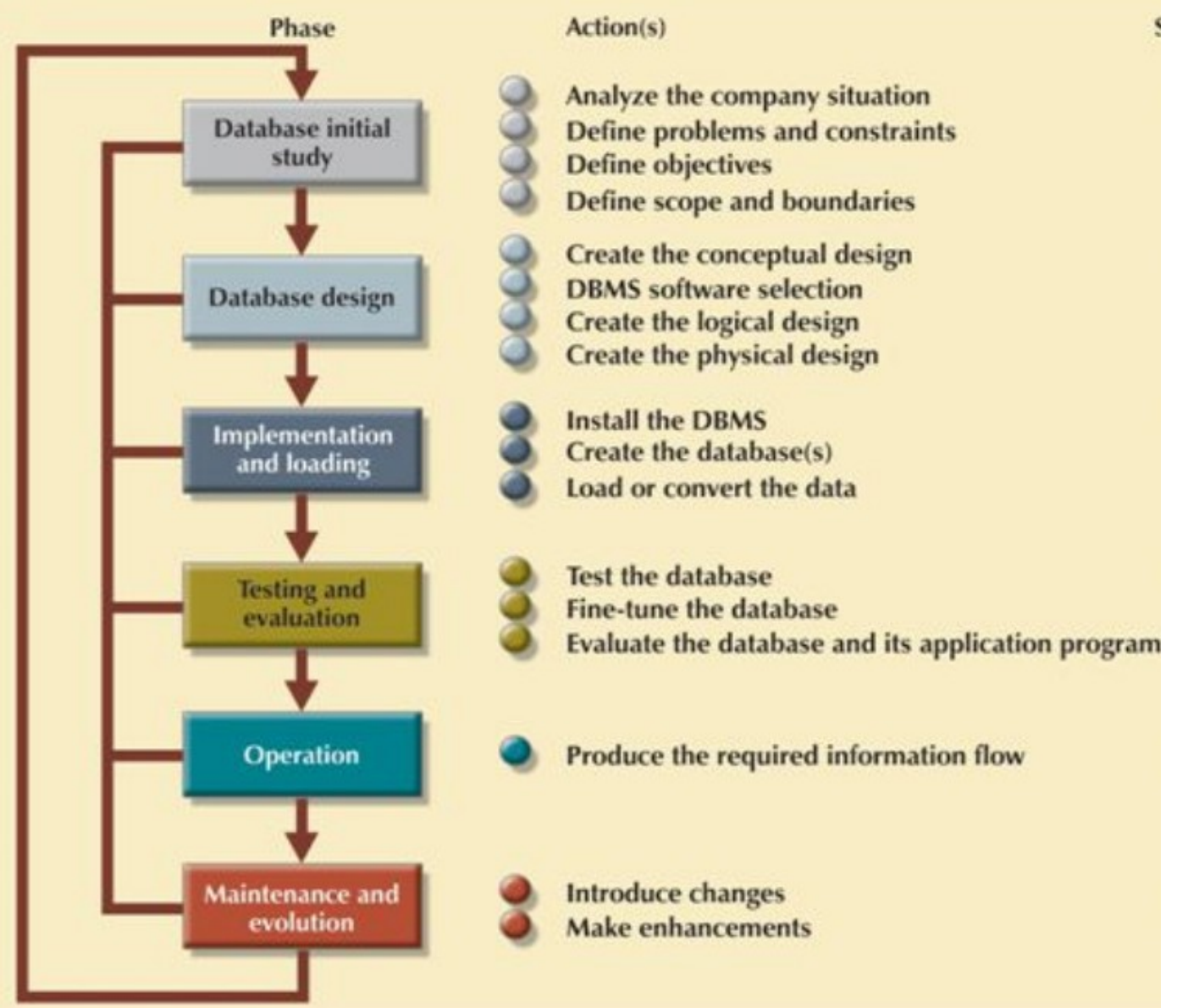
- Designer must ensure that database system objectives correspond to those envisioned by end user(s)
- Designer must begin to address following questions:
  - What is proposed system's initial objective?
  - Will system interface with other existing or future systems in the company?
  - Will system share data with other systems or users?

# Scope & Boundary

- Scope
  - Defines extent of design according to operational requirements
  - Helps define required data structures, type and number of entities, and physical size of database
- Boundaries
  - Limits external to system
  - Often imposed by existing hardware and software



# DBLC



# Database Design

- Necessary to concentrate on data
- Characteristics required to build database model
- Two views of data within system:
  - Business view of data as information source
  - Designer's view of data structure, its access, and activities required to transform data into information



# Database Design

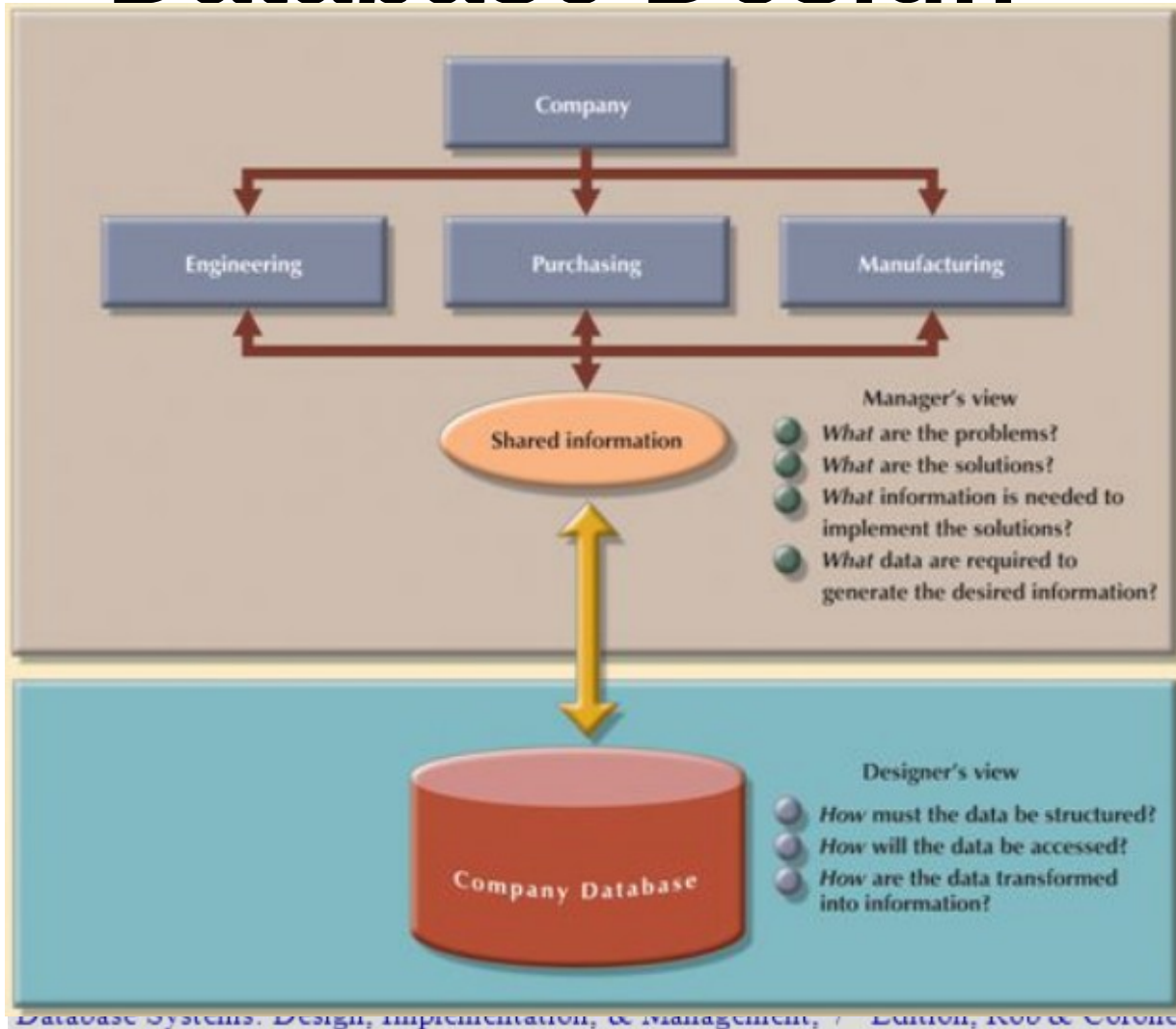
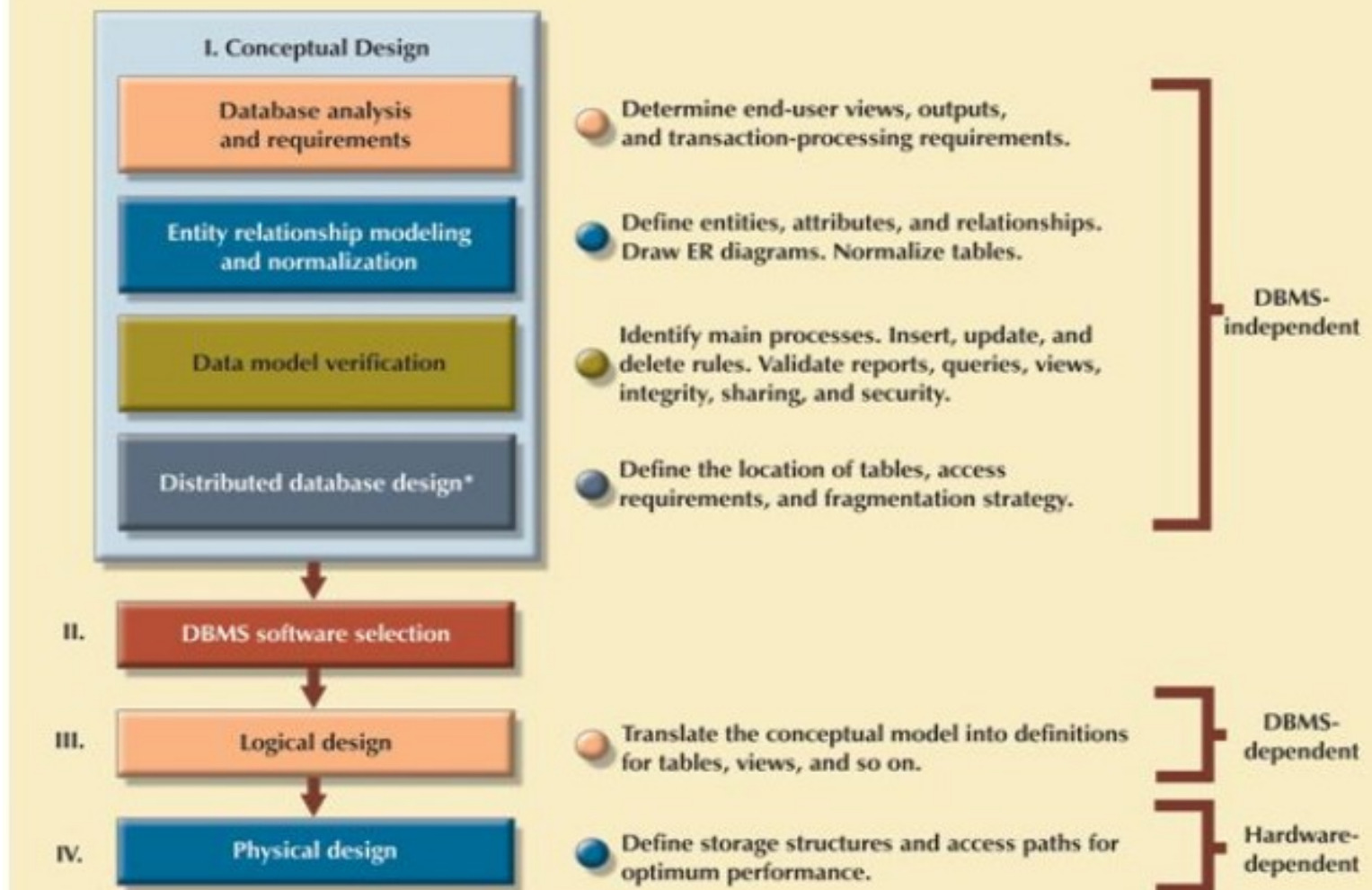


FIGURE  
9.6

Procedure flow in the database design



# Conceptual Design

- Data modeling
  - create abstract DB structure
  - Real-world representation.
- Create understanding of business & functional areas

# Conceptual Design

**TABLE 9.1** Developing the Conceptual Model, Using ER Diagrams

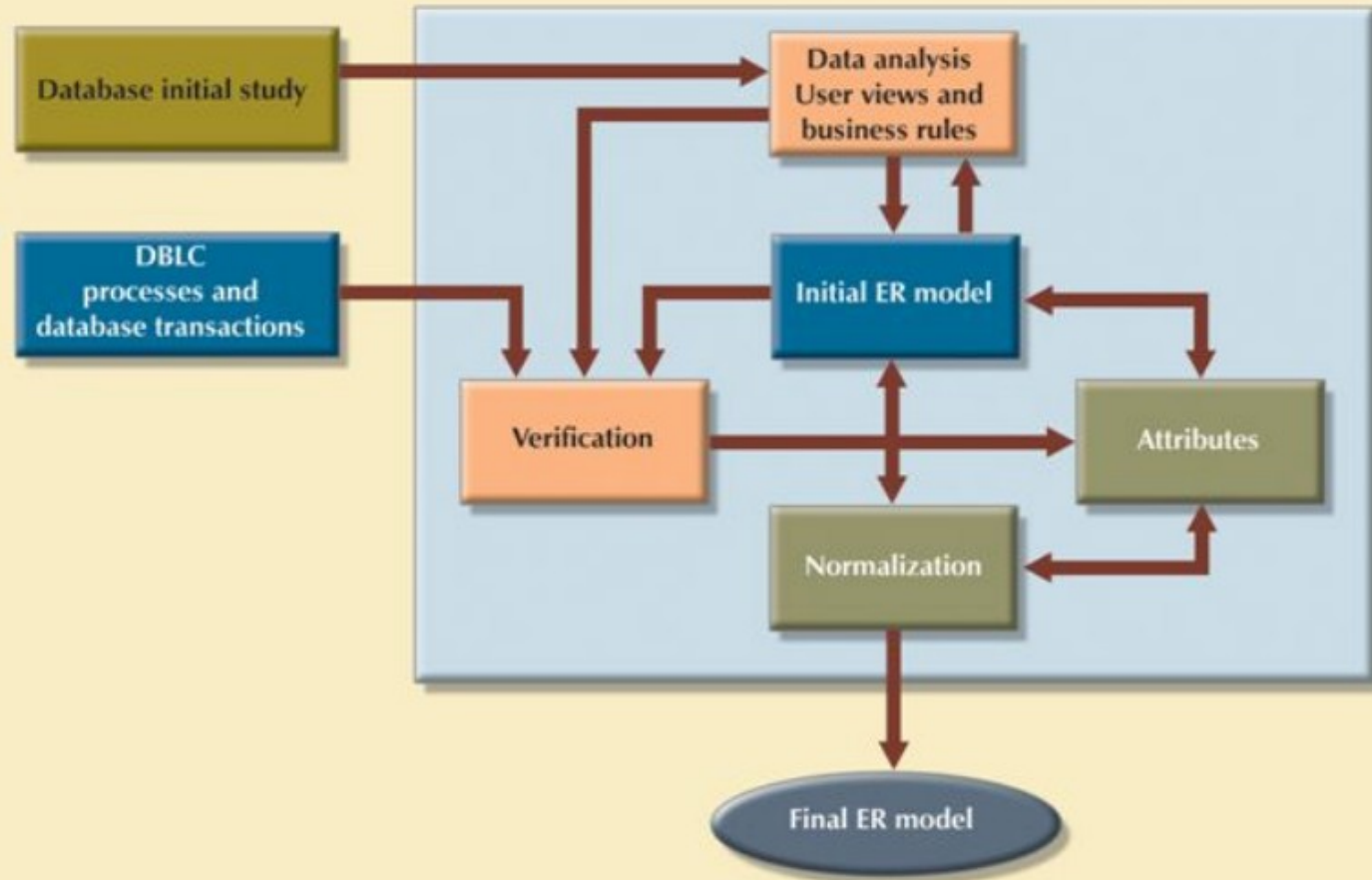
STEP	ACTIVITY
1	Identify, analyze, and refine the business rules.
2	Identify the main entities, using the results of Step 1.
3	Define the relationships among the entities, using the results of Steps 1 and 2.
4	Define the attributes, primary keys, and foreign keys for each of the entities.
5	Normalize the entities. (Remember that entities are implemented as tables in an RDBMS.)
6	Complete the initial ER diagram.
7	Have the main end users verify the model in Step 6 against the data, information, and processing requirements.
8	Modify the ER diagram, using the results of Step 7.

# Conceptual Design

FIGURE  
9.8

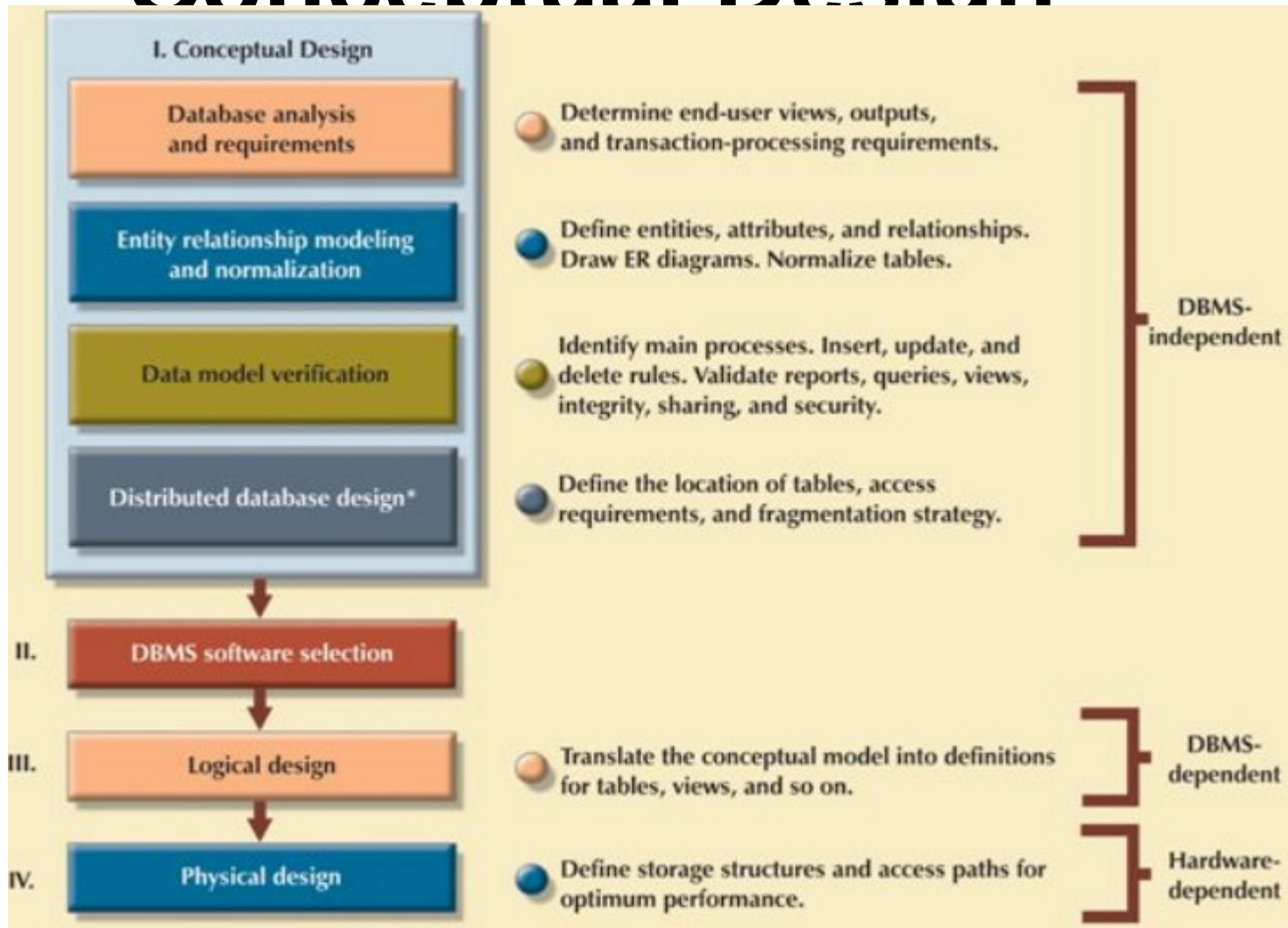
ER modeling is an iterative process based on many activities

ER Modeling is an  
iterative process





# Conceptual Design



# Conceptual Design

TABLE  
9.3

The ER Model Verification Process

STEP	ACTIVITY
1	Identify the ER model's central entity.
2	Identify each module and its components.
3	Identify each module's transaction requirements: Internal: Updates/Inserts/Deletes/Queries/Reports External: Module interfaces
4	Verify all processes against the ER model.
5	Make all necessary changes suggested in Step 4.
6	Repeat Steps 2–5 for all modules.

# Conceptual Design

Iterative ER model verification process

