CO226: Database Systems

Database Design Methodology

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Information System Life Cycle

- Database system is typically part of the information system
- Phases of the information system life cycle
  - Feasibility analysis
  - Requirements collection and analysis
  - Design
  - Implementation
  - Validation and acceptance testing
  - Deployment, operation, and maintenace

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Database System Life Cycle

- System definition
  - Defining scope of database system, its users and applications
- Database Design
  - Logical and physical design of the database system on the chosen DBMS
- Database implementation
  - Specifying conceptual, external and internal database definitions
  - Creating empty database files
  - Implementing software applications

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- Loading or data conversion
  - Populating the database
- Application conversion
  - Converting applications to the new system
- Testing and validation
- Operation
  - Running the new system
- Monitoring and maintenance
  - System maintenance
  - Performance monitoring

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Database Design Process

- Problem
  - Design the logical and physical structure of one or more databases to accommodate the information needs of the users in an organization for a defined set of applications.
- Goals
  - Satisfy the content requirements
  - Provide easy structuring of information
  - Support processing requirements and performance objectives

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- Conceptual Database Design
- Choice of a DBMS
- Data Model Mapping (Logical Database Design)
- Physical Database Design
- Database System Implementation and Tuning

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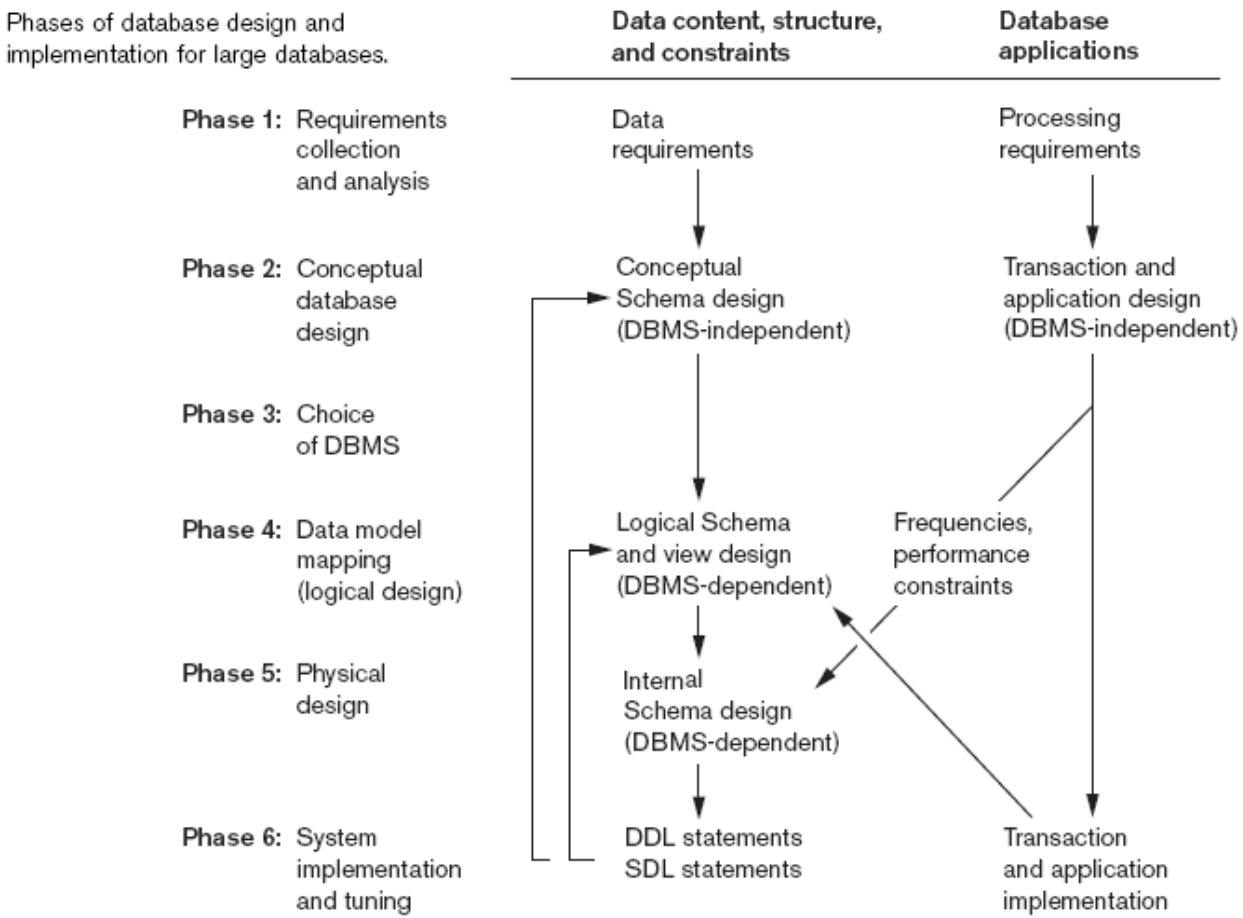

Requirements Collections and Analysis

- Identifying Users
- Interacting with users to gather requirements
- Time consuming BUT very important
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- Involves two parallel activities
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Choice of DBMS

Many factors to consider

- Technical Factors
  - Type of DBMS: Relational, object-relational, object etc.
  - Storage Structures
  - Architectural options
- Economic Factors
  - Acquisition, maintenance, training and operating costs
  - Database creation and conversion cost
- Organizational Factors
  - Organizational philosophy
    - Relational or Object Oriented
    - Vendor Preference
  - Familiarity of staff with the system
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Logical Database Design

- Transform the Schema from high-level data model into the data model of the selected DBMS.
- Design of external schemas for specific applications
- Two stages
  1. System-independent mapping
     - DBMS independent mapping
  2. Tailoring the schemas to a specific DBMS
     - Adjusting the schemas obtained in step 1 to conform to the specific implementation features of the data model used in the selected DBMS
- Result: DDL statements in the language of the chosen DBMS

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Physical Database Design

- Design the specifications for the stored database in terms of physical storage structures, record placements and indexes.
- Design Criteria
  - Response Time: Elapsed Time between submitting a database transaction for execution and receiving a response
  - Space Utilization: Storage space used by database files and their access path structures
  - Transaction throughput
    - Average number of transactions/minute
    - Must be measured under peak conditions
- Result: Initial determination of storage structures and access paths for database files

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- Database Tuning
  - System and Performance Monitoring
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