



INTRODUCTION TO DATABASE SYSTEMS

IS211-SIS211

Dr. Noha Nagy

Welcome!

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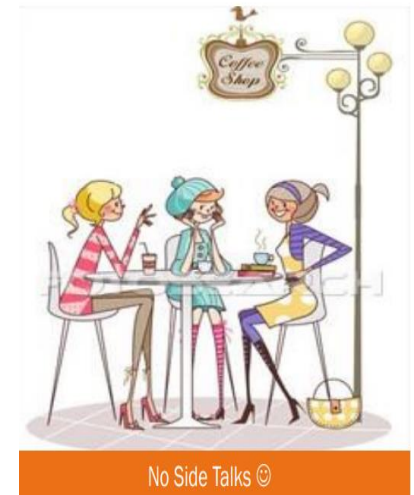
- Instructor: Dr. Noha Nagy
 - ▣ Office: Main Building, second floor
 - ▣ Email: n.nagy@fci-cu.edu.eg
- ▣ Homepage:

Lecture Norms

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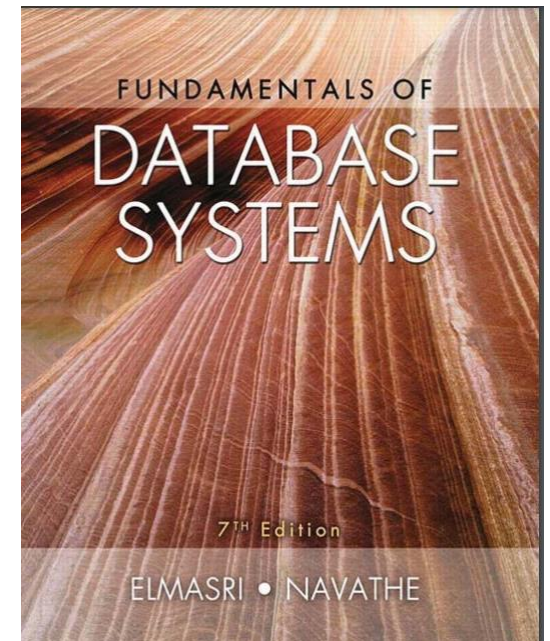
- ❑ Mobile Silent
- ❑ No side talks
- ❑ No Late entry [10 Minutes only]
- ❑ MUST carry notebook and pen
- ❑ Assignments MUST be submitted In time
- ❑ Rise your hands if you want to response or ask



Textbook

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- Fundamental of Database Systems, Ramez Elmasri, Shamkant Navathe, Addison-Wesley; th7 edition.



- The Internet

<http://auhd.edu.ye/upfiles/elibrary/Azal2020-01-22-12-28-11-76901.pdf>

Course Mechanics

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- Evaluation:
 - ▣ Final (60)
 - ▣ Midterm (20)
 - ▣ Individual assignments in labs(10)
 - ▣ Project (10)
 - 3 to 5 students
 - ▣ Popup Quizzes and participation(**Bonus**)

What you expect to study in the course?

Course Overview

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- Introduction to Database Systems
 - ▣ Theory and the use of relational database
- Focus on:
 - ▣ Relational Model
 - ▣ SQL (Structured Query Language)
 - ▣ Relational Algebra
 - ▣ The ER(Entity Relationship)Model
 - ▣ Normalization

What is Meant by Data and Information?

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vs



Data

201 20023

20

CS

Student

ID: 201 20023

Age: 20

Department: CS

What is Meant by Data and Information?

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□ Data

- ▣ Raw facts
- ▣ No context

□ Information

- ▣ Data with context
- ▣ Processed data

Accurate, relevant, and timely information is key to good decision making

Good decision making is the key to survival in a global environment

Data: A Resource

- The Success of an organization depends on efficient use of its resources:
 - ▣ Buildings, factories, equipment
 - ▣ Technical know-how
 - ▣ Human resources
 - ▣ *Data*
- *Data*: An important organizational resource

Why we need a Database?

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- What kind of data we need to store?
- Examples on DB applications
 - ▣ Hospital system
 - ▣ Business clients
 - ▣ Car registration
 - ▣ Airline reservation
 - ▣ Supermarket
 - ▣ Hotel reservation

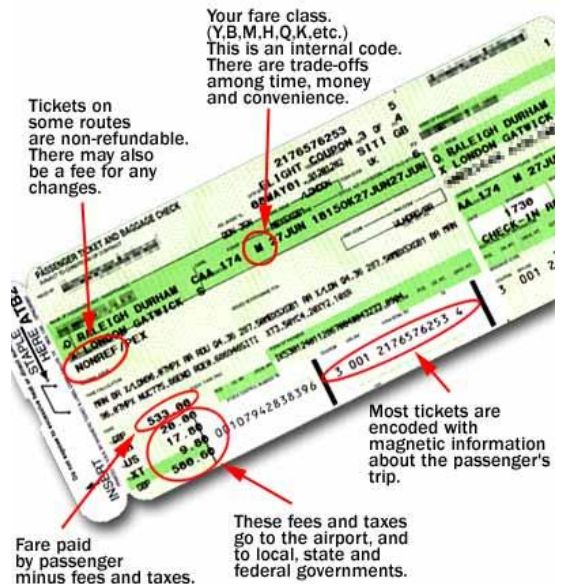


Databases Everywhere

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amazon.com



Source: Delta Airlines

© 2001 HowStuffWorks

Why should we care about databases?

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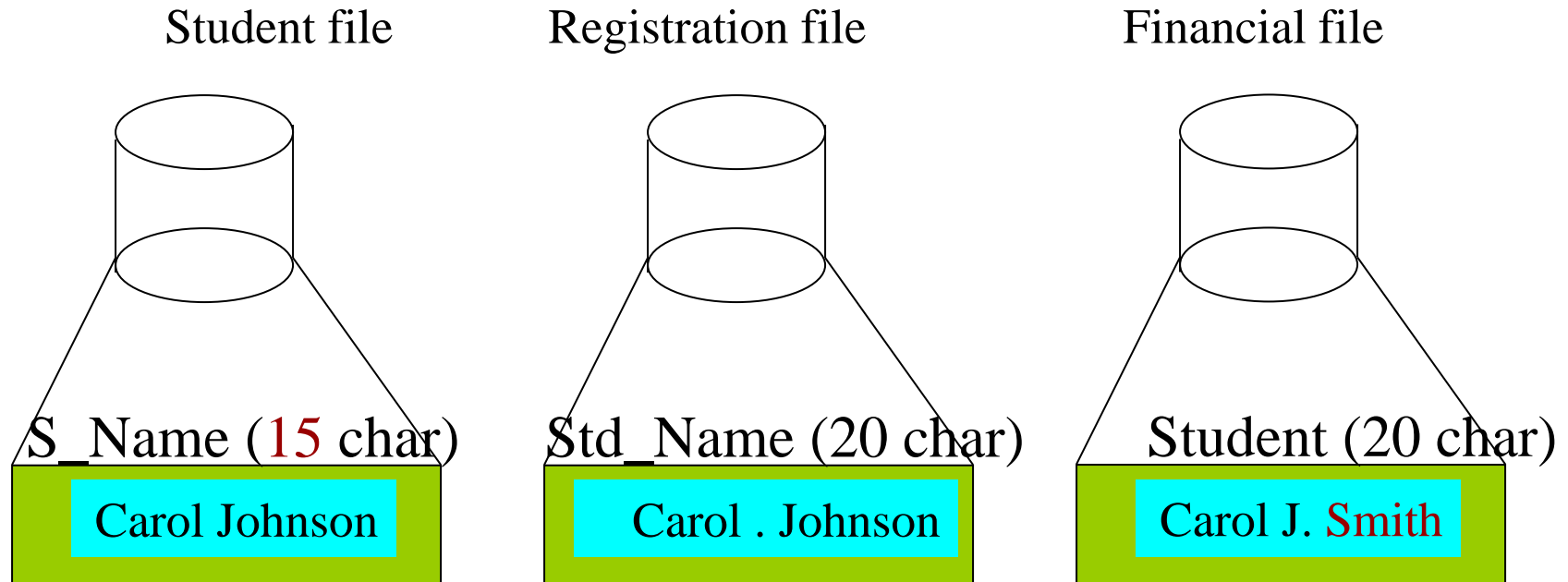
- We are in a data driven world
- “Big Data” is supposed to change the mode of operation for almost every single field
- Science, technology, Healthcare, Business

- We use DB systems to store data.

Why not to use file system?

File System: Problem Case

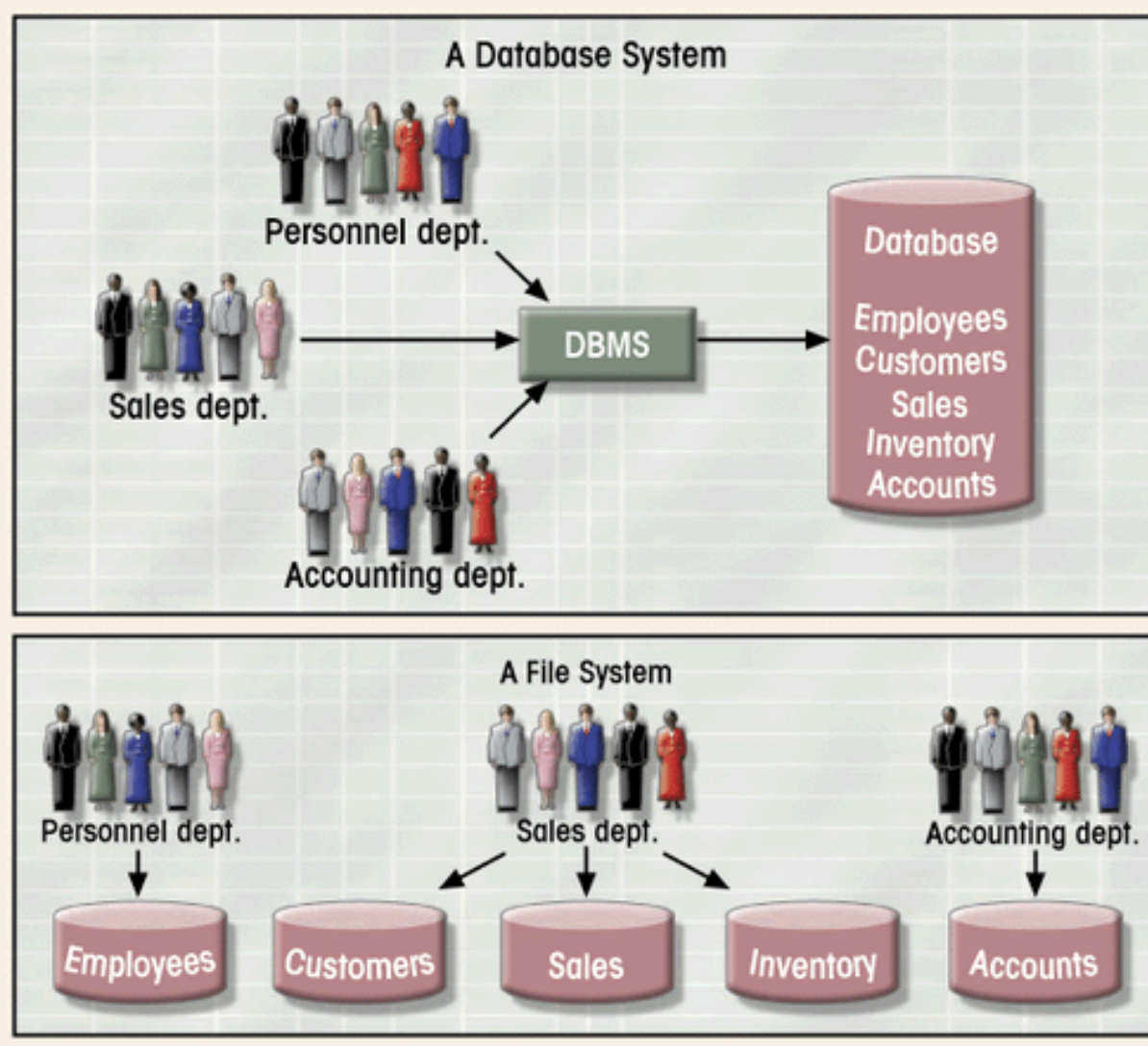
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- inconsistent field name, field size
- inconsistent data values
- data duplication

Database System vs. File System

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File Systems

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- Problems
 - ▣ **Duplication**
 - same data may be stored in multiple files
 - ▣ **Inconsistency**
 - same data may be stored by different names in different format
 - ▣ **Rigidity**
 - requires customized programming to implement any changes
 - cannot do ad-hoc queries
- Implications
 - ▣ Waste of space
 - ▣ Data inaccuracies
 - ▣ High overhead of data manipulation and maintenance

DB Systems

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- It answers queries fast
 - ▣ Q1: among a set of log pages, find those pages written by Tramp after 2019
 - ▣ Among a set of employers, increase the salary by 20% for those who have worked longer than 4 years
- Queries from **multiple** users can execute **concurrently** without affecting each other.
- It recovers from crash
 - ▣ No **corrupted** data after restart

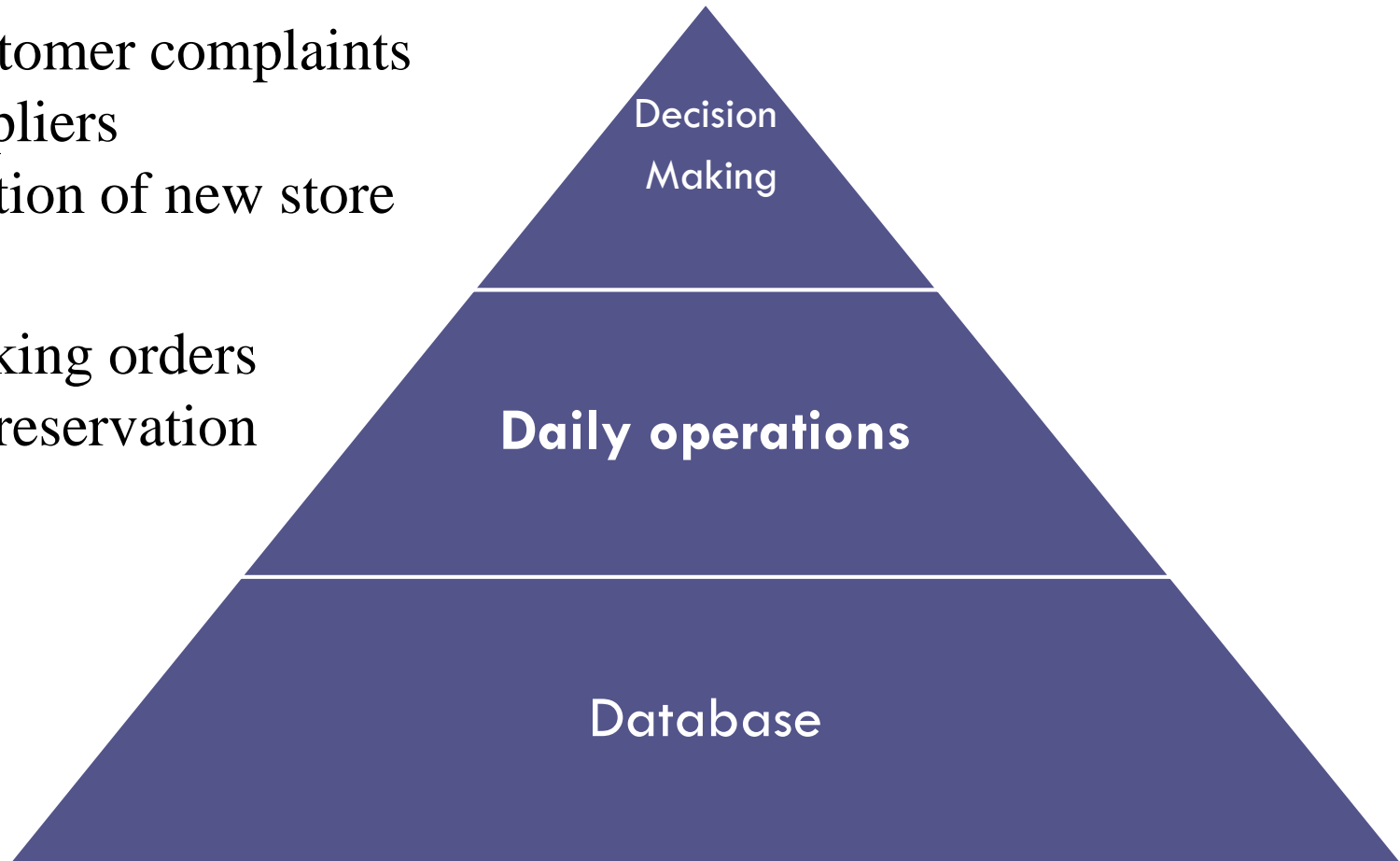
File System Vs Databases

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- ❑ Small Systems
- ❑ Often single user
- ❑ Simple structure
- ❑ Isolated data
- ❑ Redundant data
- ❑ Relatively cheap
- ❑ Less secure
- ❑ Large systems
- ❑ Multiple users
- ❑ Complex structure
- ❑ Shared data
- ❑ Reduced redundancy
- ❑ Relatively expensive
- ❑ More secure using views

Resolving customer complaints
Choosing suppliers
Deciding location of new store

Taking orders
Making reservation



Definitions

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- **Database:**
 - ▣ Collection of related data.
 - ▣ A database contains a model of something!

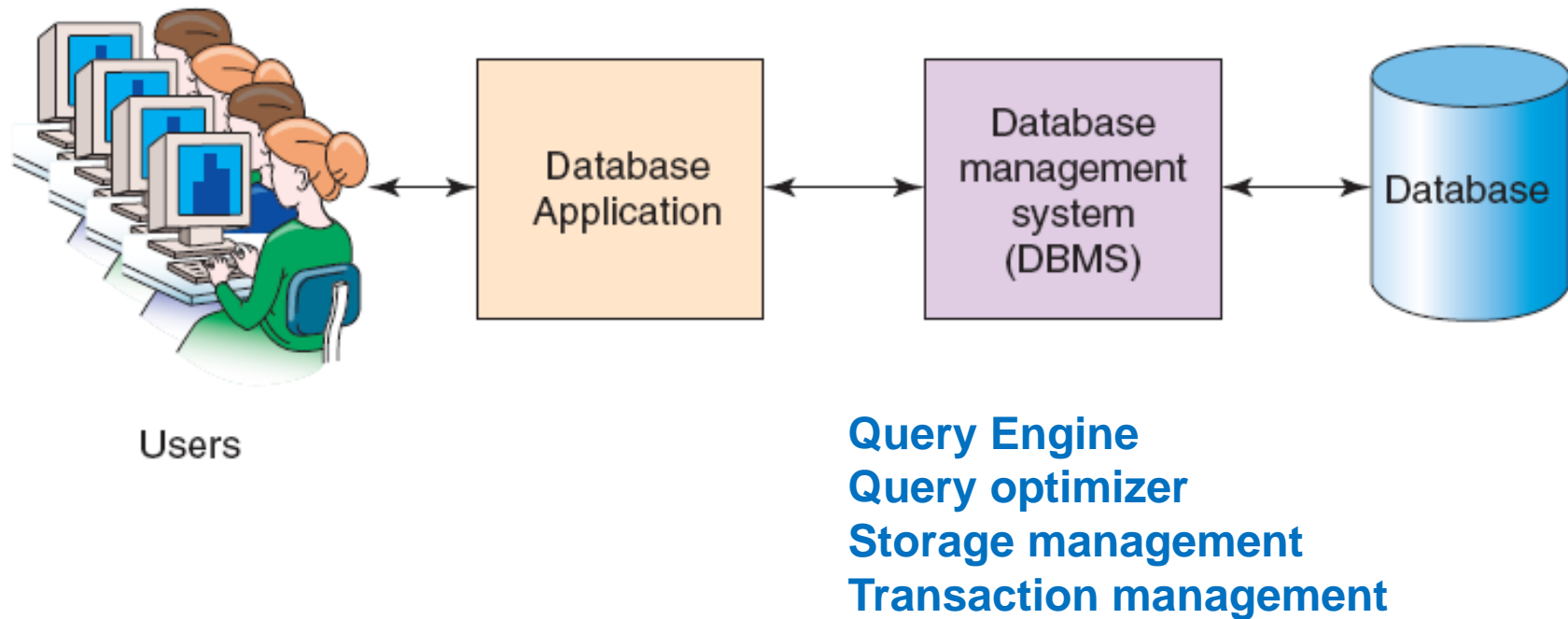
- **A Database Management System (DBMS):** is a software system designed to store, manage and facilitate access to the database

- **Database/Application Program:** A computer program that interacts with the database through the DBMS



Components of a Database System

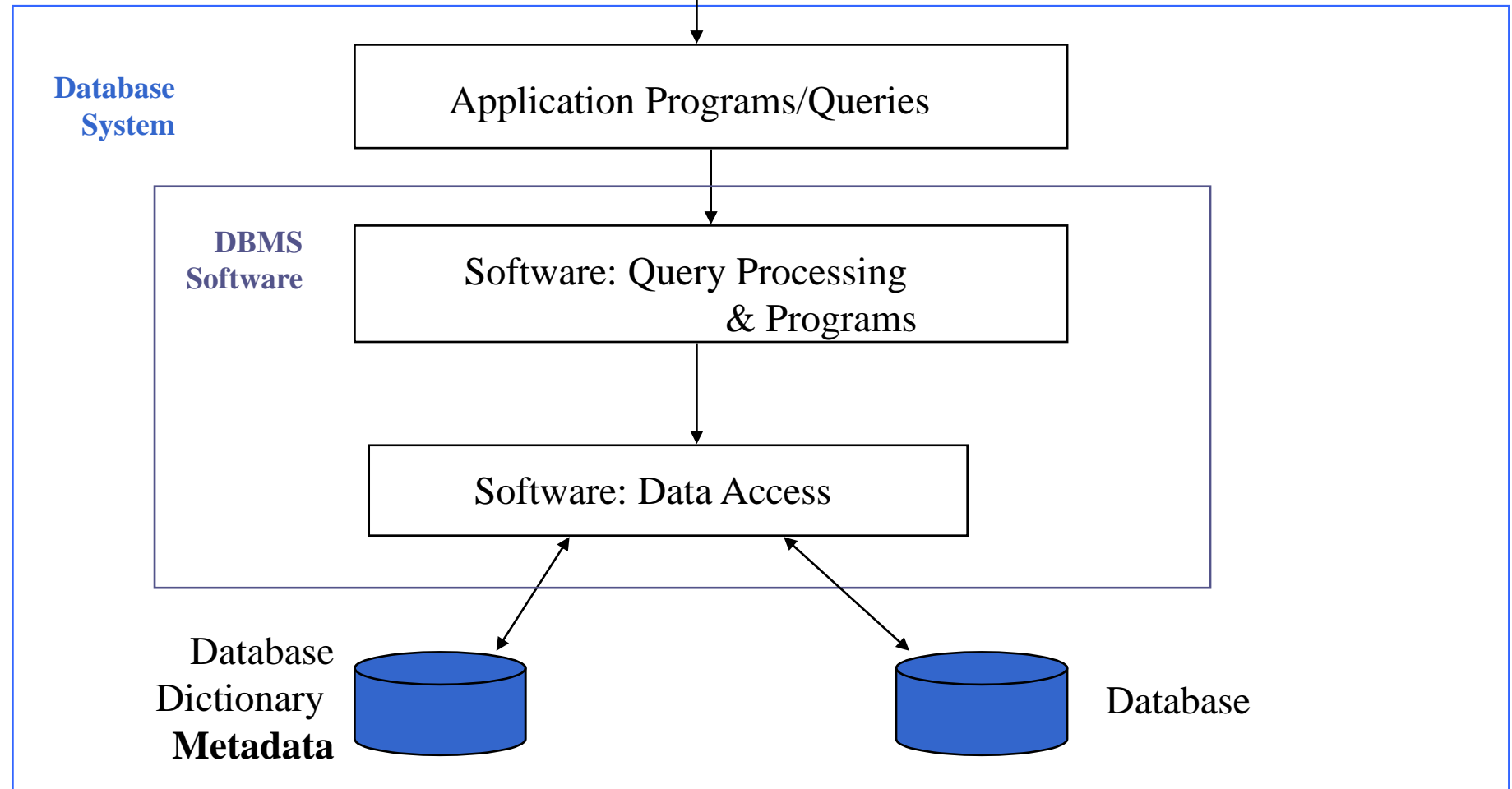
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Database System Environment

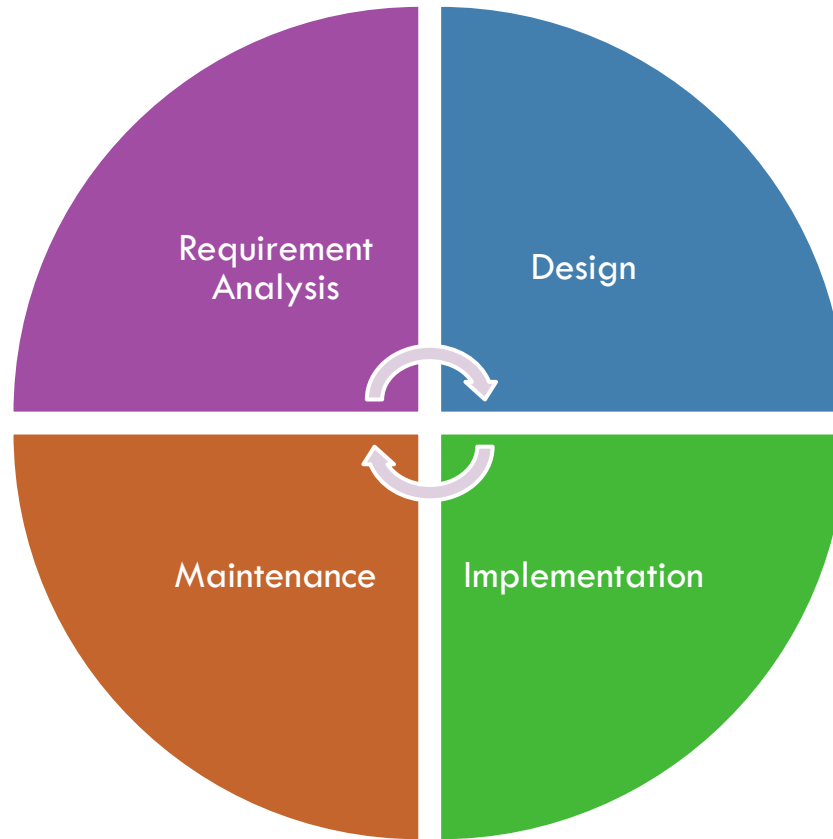
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Users/Programmers



Database Systems Lifecycle

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Database Players

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- **DB Administrator DBA**

- ▣ Access authorization, coordination & monitoring database usage, problem determination, performance tuning etc

- **Designers**

- ▣ choose the appropriate structures to represent & store the data

- **System analysts & application programmers**

- **Users**

Database States

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- **Empty State:** DB is empty when we first define the DB schema
- **Initial State:** DB is first populated or loaded with data
- **Current State:** snapshot in time

Example of Relational DB Management System Products

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- ❑ Oracle
- ❑ Sybase
- ❑ Informix (Unix)
- ❑ DB2, SQL/DS (IBM)
- ❑ Access, SQL Server (Microsoft)



Database Models

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A Database model is a collection of concepts that can be used to define the DB structure (data items, types, relationships, operations, behaviors and constraints)

- **Relational model**
- Hierarchical & Network models
- Object Oriented models
- Distributed models
- NoSQL models
- And Others



Next Relational Model
