Database Management System

(DBMS)

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Objective

" To make you known about the fundamentals of Database Management System and Improve ourselves by taking valuable feedbacks from you."

Contents

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- What is Information?
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Introduction

- DBMS stands for Database Management System.

- DBMS is a software system for creating, organizing and managing the database.

- It provides an environment to the user to perform operations on the database for creation, insertion, deletion, updating and retrieval of data.

What is Data ?

- A collection of raw facts and figures.
- Raw material that can be processed by any computing machine.
- A collection of facts from which conclusions may be drawn.
- Data can be represented in the form of numbers and words which can be stored in computer's language.
  i.e. Paan Singh, Anshul 007

What is Information?

- Systematic and meaningful form of data.
- Knowledge acquired through study or experience.
- Information helps human beings in their decision making.

Database

- A repository of logically related and similar data.

- An organized collection of related information so that it can easily be accessed, managed and updated.

  E.g.:

  Dictionary

  Airline Database

  Student Database

  Library

  Railways Timetable

  YouTube (All songs of Rahul Vaidya)

Data Models, Schema and Instances

- **Data Models:**

-Describes structure of the database.

-Aim is to support the development of information systems by providing the definition and format of data.

-If the same data structures are used to store and access data then different applications can share data.

-Classification:

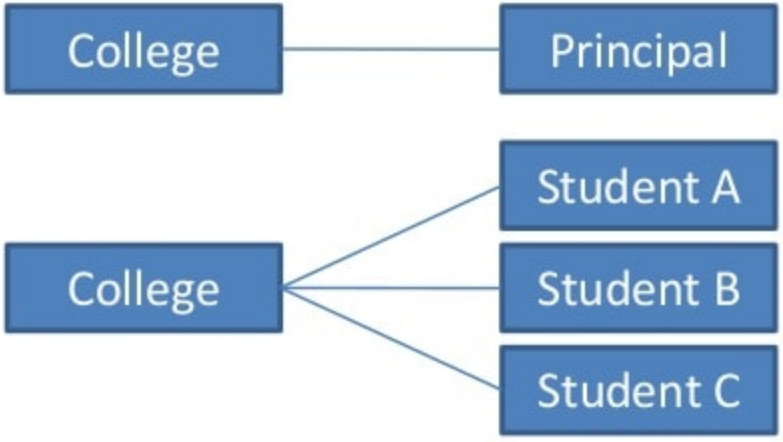
1. High-Level Model
2. Representation Model
3. Low-Level Model

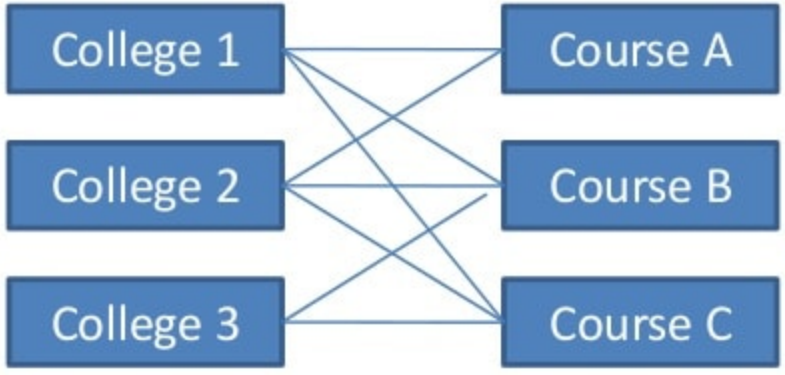
1. High-Level Model

- Ensures data requirement of the users.
- Not concerned with representation, but
  it's a conceptual form.
- Three Imp terms:
  a)Entity: - Any object, exists physically or conceptually.
  b)Attribute:- Property or characteristic of entity.
  c)Relationship:- Association or link b/w two entities.

- These 3 terms make Entity-Relationship Model.

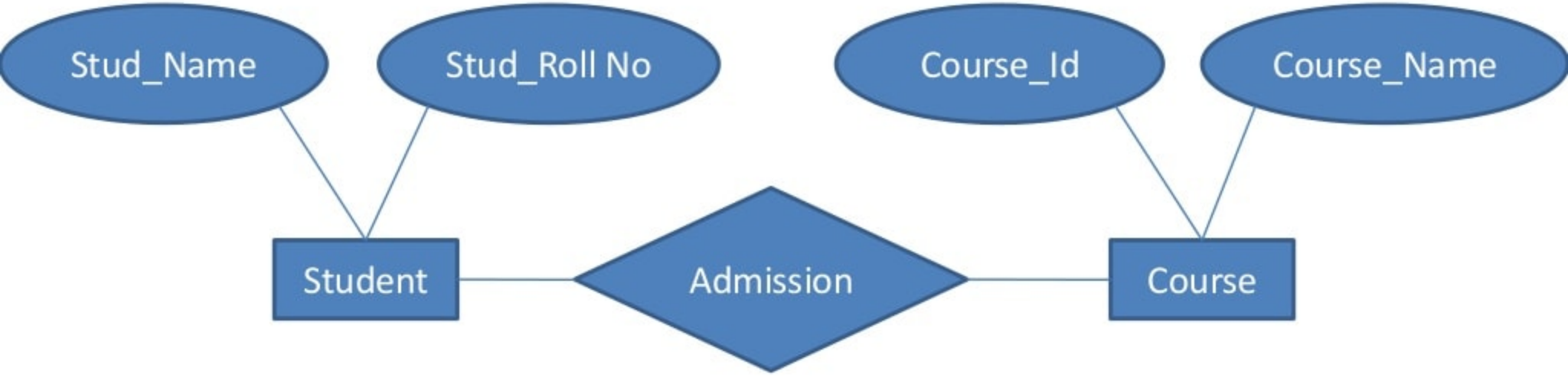
Entity-Relationship (E-R) Model





Relationships

E-R diagram



2. Representation Model

- Representation of data stored inside a database.
- Describes the physical structure of the database.
- It uses the concepts which are close to the end-users.

- Classification:

    a. Hierarchical

    b. Relational

    c. Network

a. Hierarchical Database Model

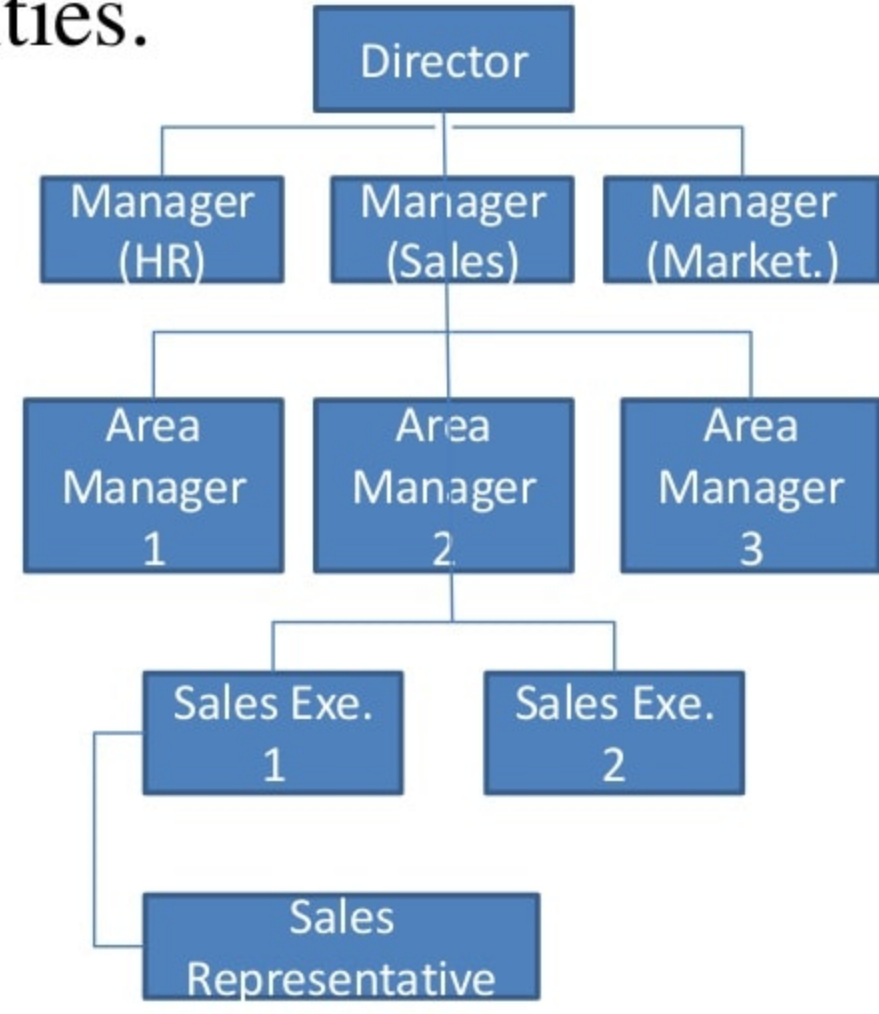
- Developed by IBM, is the Oldest database model.
- Represented using a tree-diagram. (Parent-child relationship)
- Each box is called a 'Node'
- The nodes represent a record type.
- A line connecting nodes represents the link.

Cont…

- Parent-child type is suited for One-to-many relationship between two entities.
- But difficult to implement many-to-many relationship.

e.g.:

IMS system from IBM.



b. Relational Database Model

- Simplest and the most common model.
- Developed in 1970 by E.F. Codd, it became commercial in the 80s.
- Data elements are stored in different tables made up of rows and columns.

Roll No	Name	Surname	Section
1001	Rajkumar	Tomar	D
1002	Rajkumar	Singh	D

Cont…

- Terminologies:
  -Data Values: alphanumeric raw data (Rajkumar)
  -Columns: fields (item or object that holds the data)
  -Rows: record (a group of data for related field)
  -Table: collection (all records & fields)
  -Key: identifier (uniquely identifies a row in the table. It can be value of a single or multiple column.

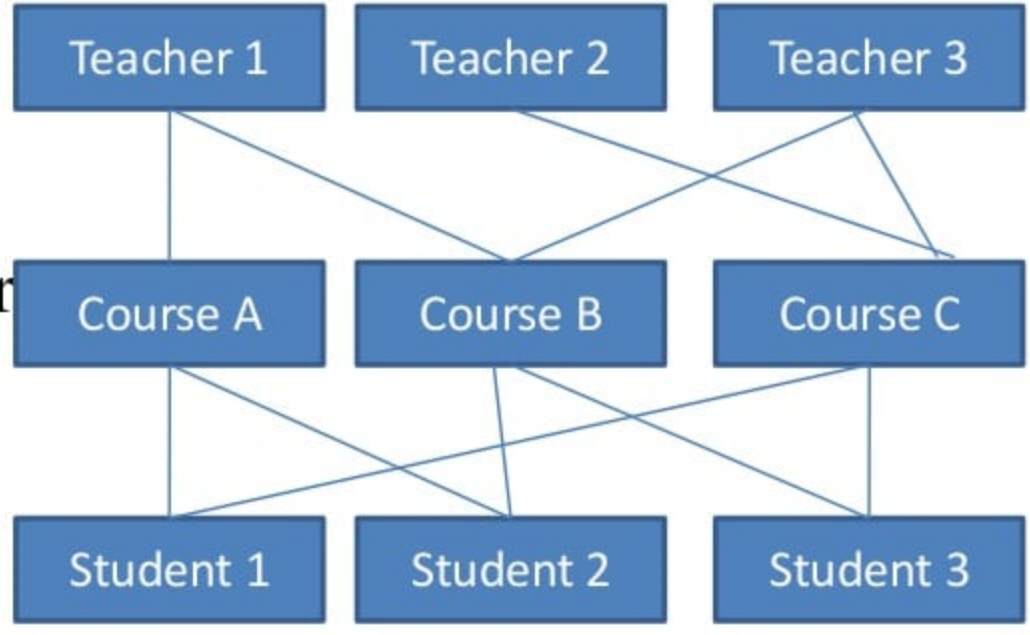
  e.g.:

  DB2, ORACLE, SQL Server.

Roll No	Name	Surname	Section
1001	Rajkumar	Tomar	D
1002	Rajkumar	Singh	D

c. Network Database Model

- Represented using a Data-Structure Diagram.
- Boxes represents the records & lines the links.
- Based on 'owner-member relationship.'
- Members of an owner may be many but for many member owner is one.
- Can represent one-to-one and many-to-many as well.



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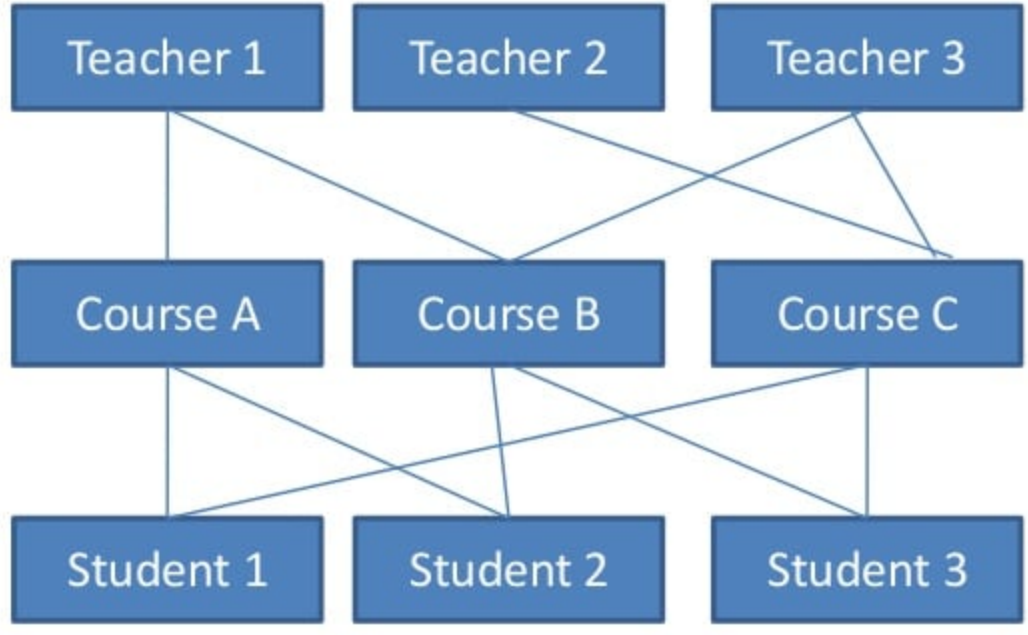
- One-to-many relationship is converted into a set of one-to-one.
- Also, many-to-many is converted into 2 or more one-to-many relationship.

  e.g.:

  IDMS, IMAGE.



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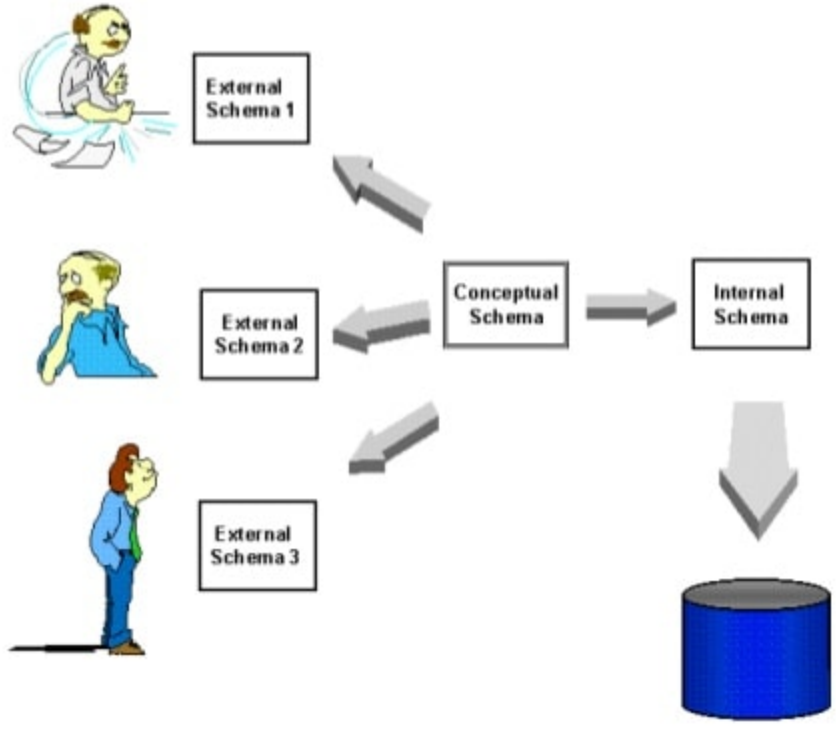
- **Schema:**

  - Logical structure of the database.
  - Doesn't show the data in database.
  - Classification:

    1. Physical
    2. Conceptual
    3. External



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1. Physical Schema:

-Describes the physical storage of database.

-Not in terms of blocks or devices, but describes organization of files, access path etc.

2. Conceptual Schema:

-Describes structure of whole database.

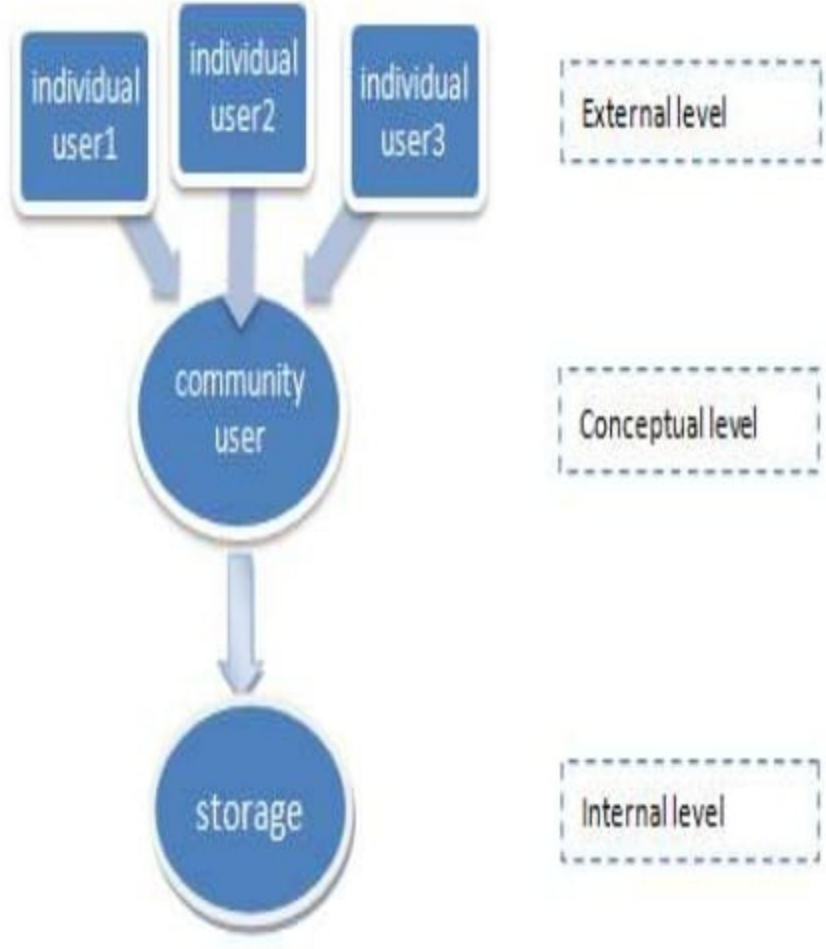
-Describes entities their relationships and constraints.

3. External Schema:

-Provides a user's view of data.

-Shows relevant info particular to user, hides rest of the info.

-one or more levels.

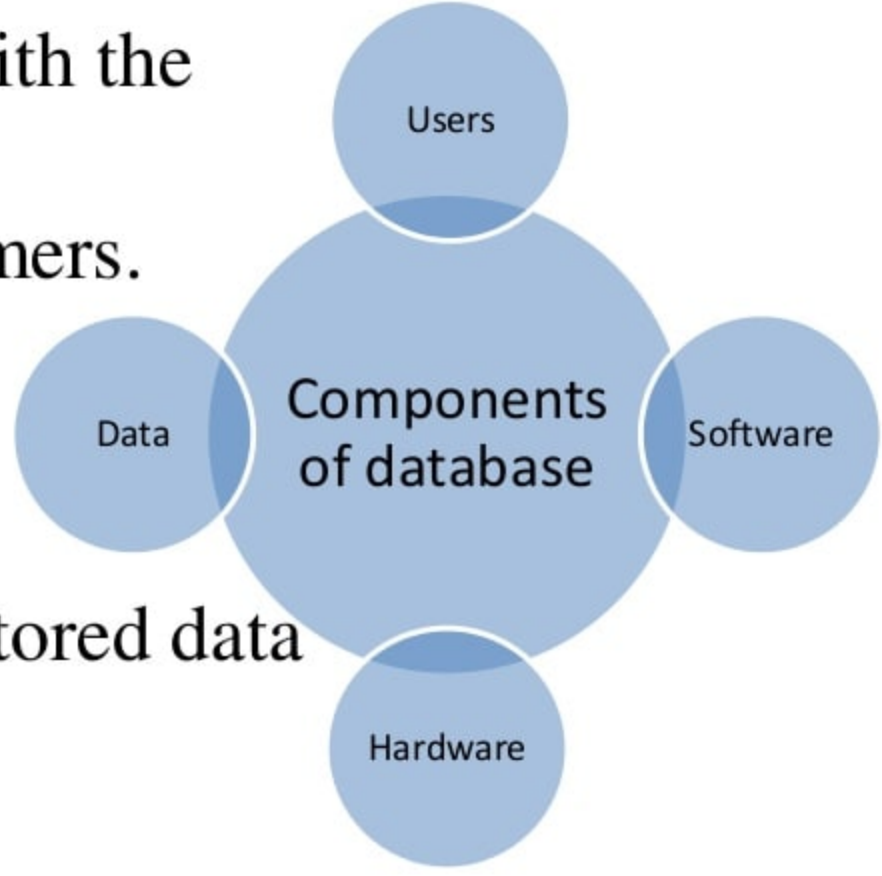


➢ **Instances:** Actual data contained in database at a particular point of time.

Components of Database System

• **Users**- People who interact with the database:

- Application Programmers.
- End Users.
- Data Administrators.



• **Software**- Lies between the stored data and the users:

- DBMS.
- Application Software.
- User Interface.

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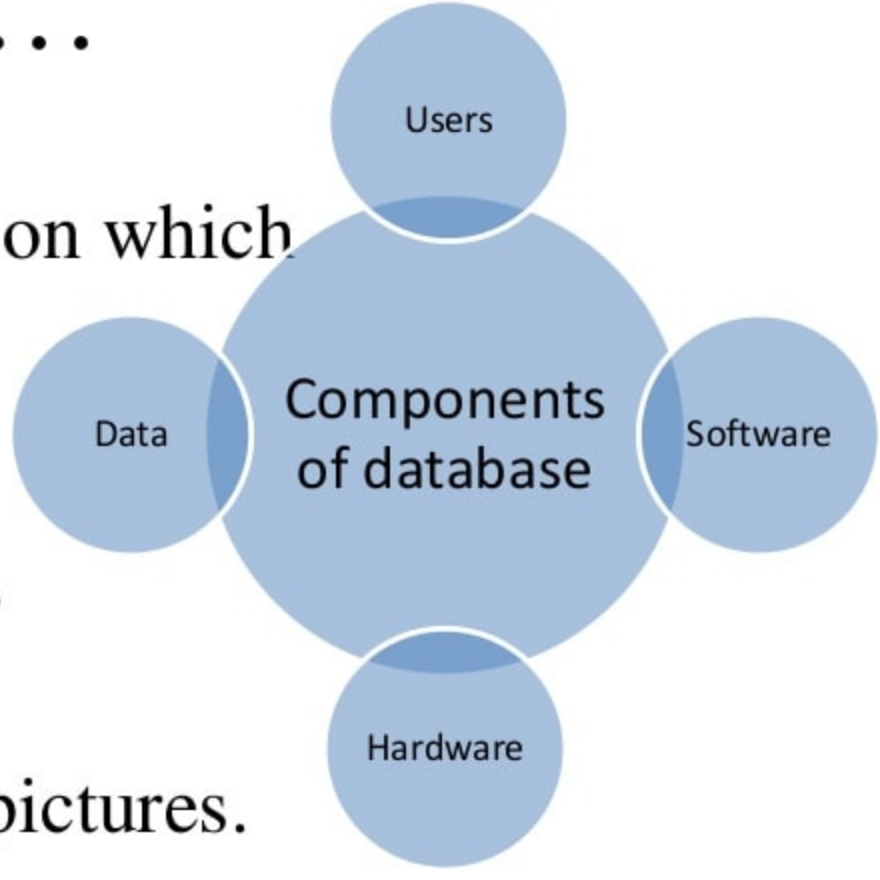


- **Hardware**- Physical device on which database resides.

  e.g.:

  Computers, Disk Drives,

  Printers, Cables etc.

- **Data**- numbers, characters, pictures.

  e.g.:

  Shri Shri Nilesh, 1008, India.

What is DBMS ?

- A set of programs to access the interrelated data.
- DBMS contains information about a particular enterprise.
- Computerized record keeping system.
- Provides convenient environment to user to perform operations:

  -Creation, Insertion, Deletion,

  Updating & Retrieval of information

Database Administrator (DBA)

- Individual or a group, having centralized control of the database.
- Has a good understanding of database and coordinates all activities of the database.
- Functions:

  -Defines schema.

  -Defines storage structure and access methods.

  -Modification of both.

  -Granting user authority to access the database.

  -Monitoring performance and responding to changes.

Database Languages

- Once data is filled, manipulation is required (insertion, deletion, modification of data)
- For these, a set of languages is provided by DBMS:

    1. Data Definition Language.
    2. Data Manipulation Language.
    3. Data Control Language.

Cont…

1. **Data Definition Language (DDL):**
   -Used by DB designers to define schema.
   -DDL compiler converts DDL statements and generate a set of tables which are stored in.
   e.g.: SQL

2. **Data Manipulation Language (DML):**
   -For accessing and manipulating the data.
   e.g.: SQL

3. **Data Control Language (DCL):**
   -Similar to a computer programming language used to control access to data stored in a database.
   -operations like:
   CONNECT, SELECT, INSERT, UPDATE, DELETE, EXECUTE, and USAGE.
   e.g.: SQL

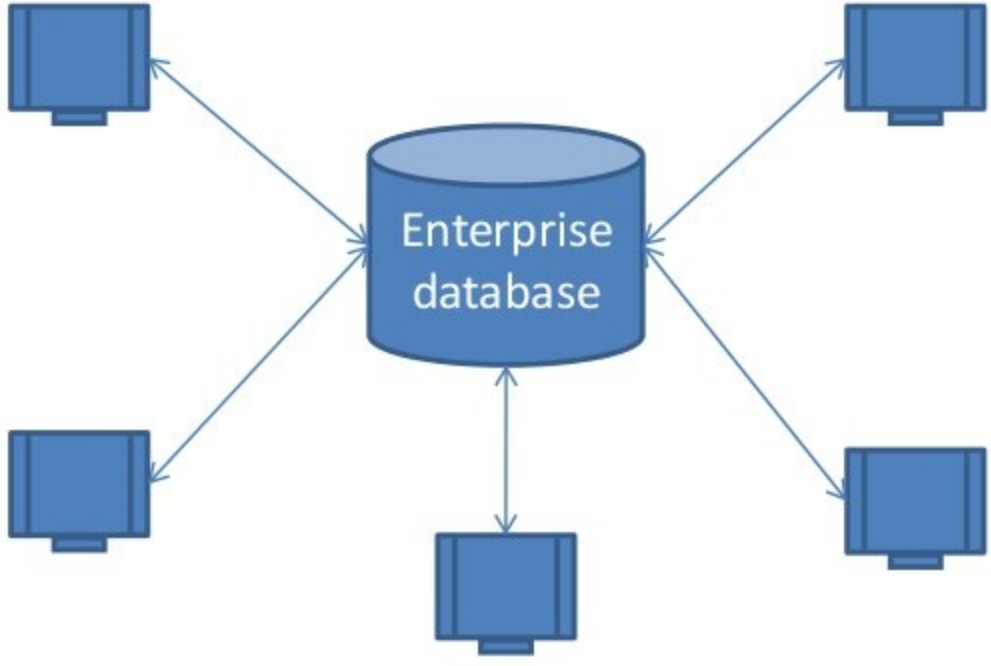
Database System Architectures

- The journey from big mainframe to pc has also evolved the database and its architecture.
- Classification:

1. Centralized DBMS Architecture
2. Client-Server Architecture
3. Distributed Databases

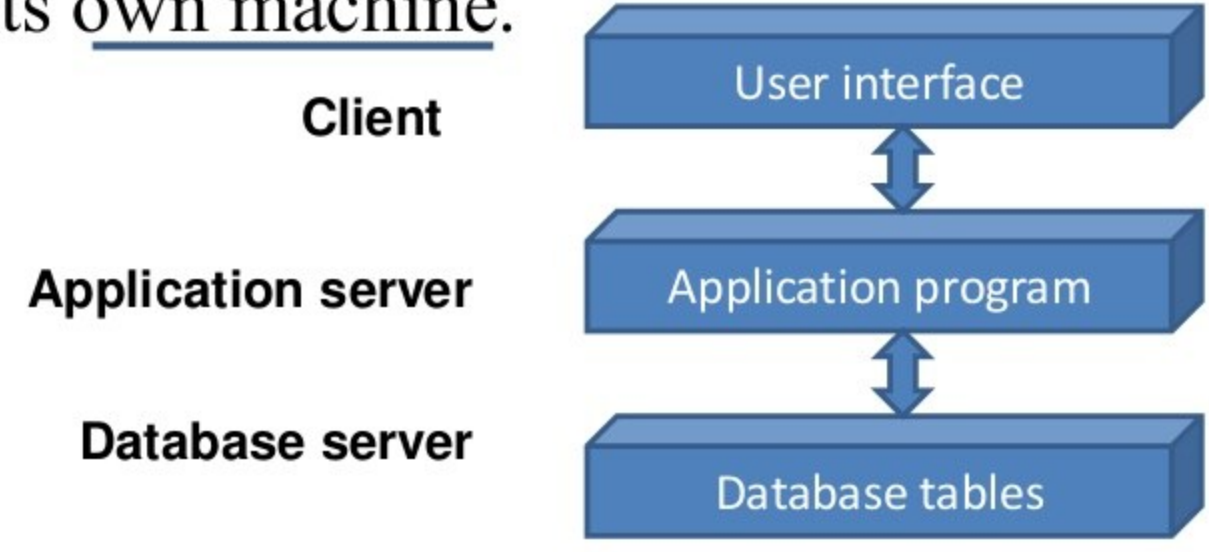
1. Centralized DBMS Architecture

- Traditional form, all data, functionality, apps are located on one machine.
- Access via communication links.



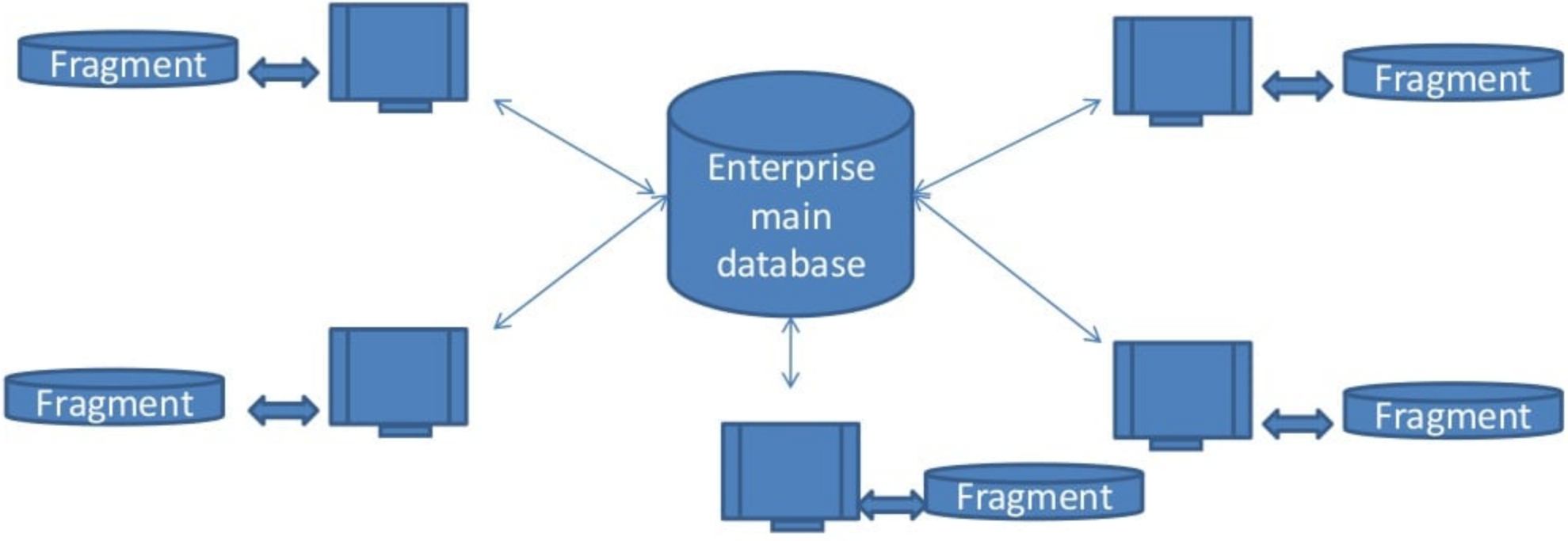
2. Client-Server Architecture

- Involves a client and a server.
- Clients are PCs or workstations.
- Servers are powerful computers, can manage files, printers, e-mails.
- Client interacts server when additional functionality doesn't exits in its own machine.



3. Distributed Database Architecture

- Decentralized functionality, distributed among many computers.
- Storage computers are at diff. geographical locations.



Advantages of DBMS

- **Controlling Data Redundancy:** Data is recorded in only one place in the database and it is not duplicated.
- **Data Consistency:** Data item appears only once, and the updated value is immediately available to all users.
- **Control Over Concurrency :** In a computer file-based system in updating, one may overwrite the values recorded by the other.
- **Backup and Recovery Procedures:** automatically create the backup of data and restore data if required.
- **Data Independence:** Separation of data structure of database from application program that uses the data is called data independence.

Disadvantages of DBMS

- **Cost of Hardware and Software:** Processor with high speed of data processing and memory of large size is required.
- **Cost of Data Conversion:** Very difficult and costly method to convert data of data file into database.
- **Cost of Staff Training:** A lot of amount for the training of staff to run the DBMS.
- **Appointing Technical Staff:** Trained technical persons such as database administrator, application programmers, data entry operators etc. are required to handle the DBMS.
- **Database Damage:** All data is integrated into a single database. If database is damaged due to electric failure or database is corrupted on the storage media, then your valuable data may be lost forever.

Examples of DBMS

- Some of the common used DBMSs are:
  -Oracle, IBM's DB2, Microsoft's SQL Server,
  MS-Access and Informix.

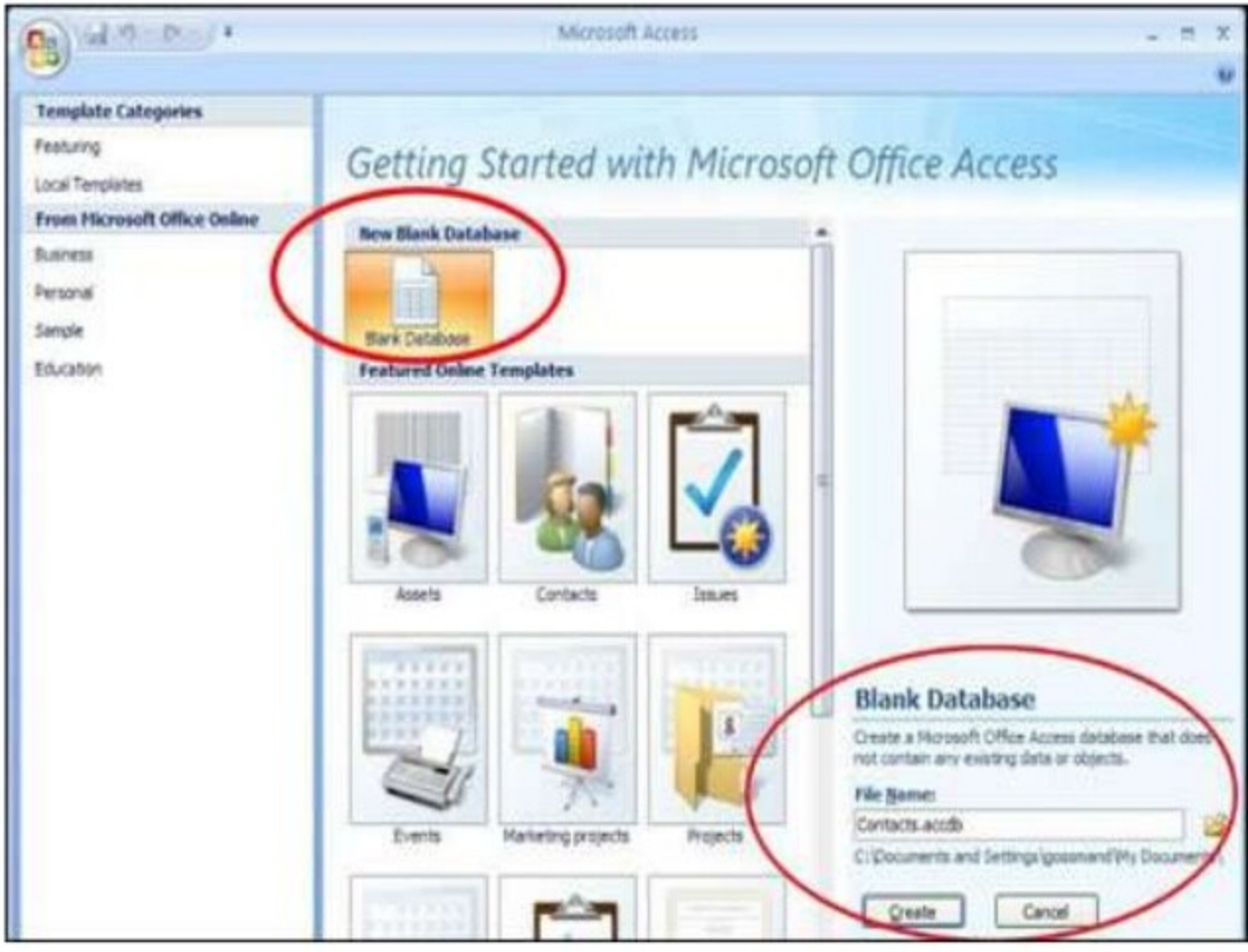
- Some of the desktop based DBMSs are:
  -Microsoft FoxPro, Borland dBase and
  Microsoft Access.

MS-Access (2007)

- Allows creation of database for MS Windows family.
- Permits user to design and create complete database with quick and easy data entry.
- Can store any kind of data:

  Numbers, pages of text, pictures etc.
- Is a tool for managing the data base.
- It's a Relational DBMS.

Getting started…

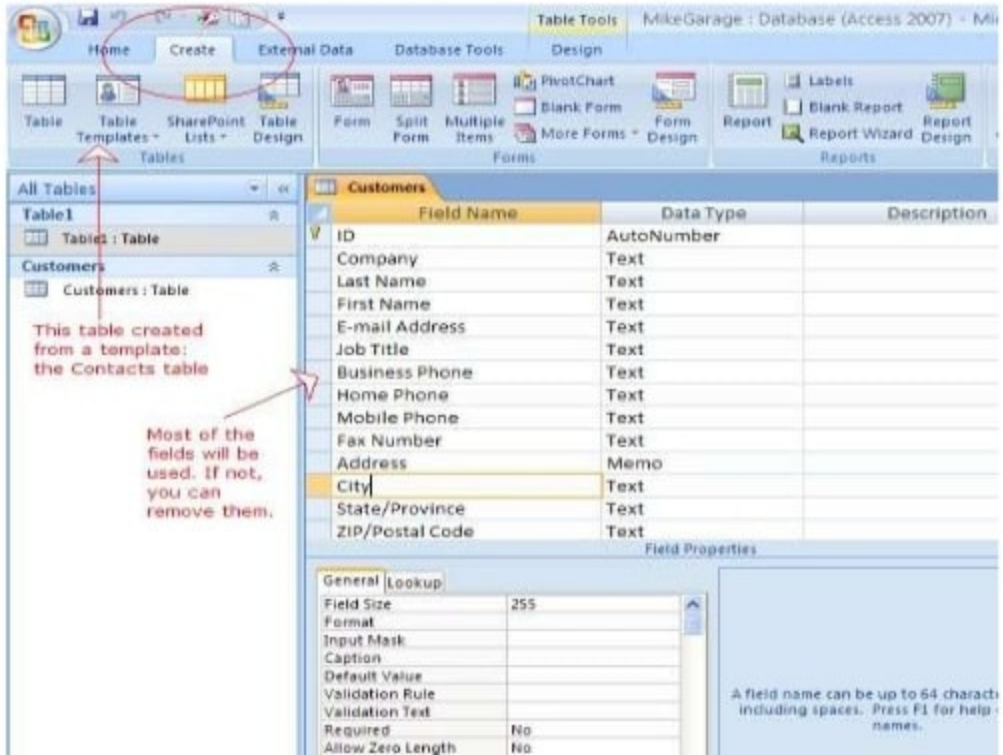


Features of MS-Access 2007

- User can create tables and manage them.
- Can design reports to present the data.
- Attach files to the database.
- It permits filtering the data based on text, numbers and date, and also sorts the data.
- Allows queries to analyze the data.

Toolbar

- **Home:** View, clipboard, records, sort, find.
- **Create:** Tables, forms, reports, query (other).
- **External Data:** Import, export, collect data.
- **Database Tools:** Show, hide, analyze, move data.
- **Datasheet:** Views, fields & columns, format, relationship.



The Create tab

- **Tables**:

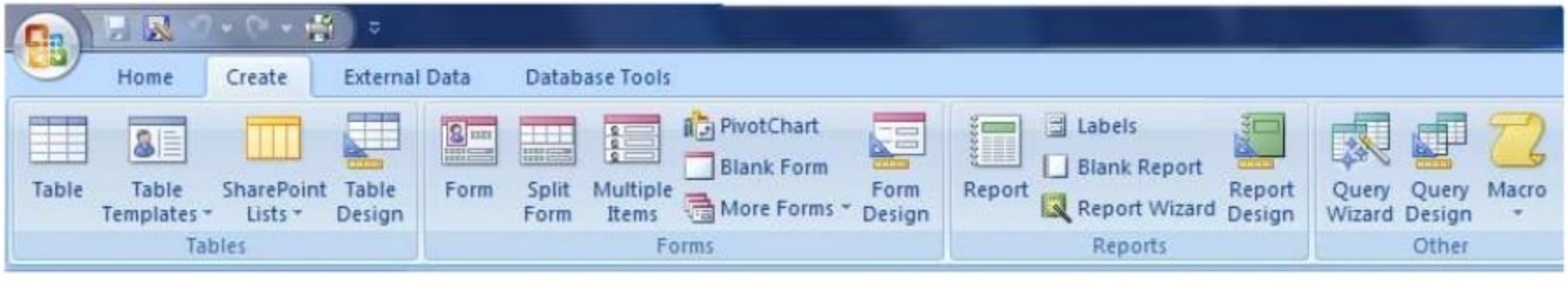
  -Stores data.

  -We can add tasks, events, contacts, design etc.

- **Forms**:

  -Edit it.

  -Blank form, split form, multiple items etc.



Cont…

- **Reports**:

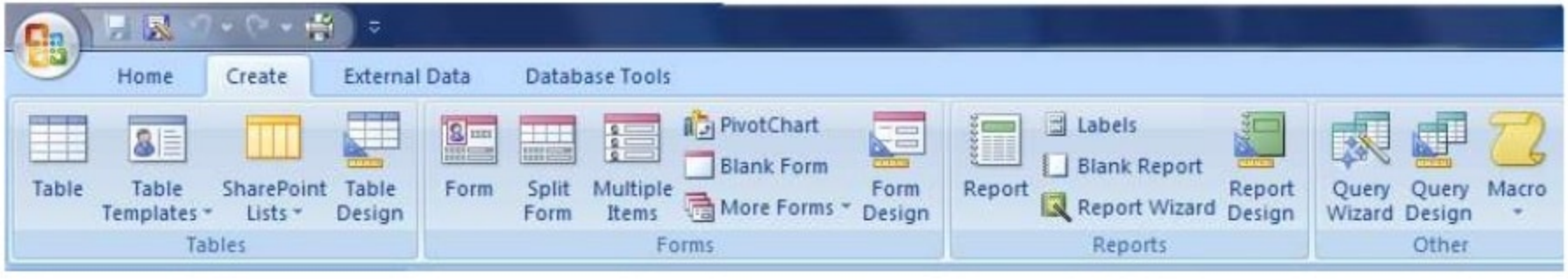
  -Print it.

  -Blank report, customized report, report in design.

- **Query**:

  -Search it.

  -Create a query, find duplicate query, unmatched query, select table for creating a query.



Applications of DBMS

- **Airlines and Railways:** Online databases for reservation, and displaying the schedule information.
- **Banking:** Customer inquiry, accounts, loans, and other transactions.
- **Education:** Course registration, result, and other information.
- **Telecommunications:** Communication network, telephone numbers, record of calls, for generating monthly bills, etc.
- **E-commerce:** Business activity such as online shopping, booking of holiday package, consulting a doctor, etc.
- **Human resources:** Organizations use databases for storing information about their employees, salaries, benefits, taxes, and for generating salary checks.

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Information Technology training Program, Module II, CA-IPC

Computer Fundamentals – P. K. Sinha

Thank You!

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Queries…