CS105.3 Database Management Systems

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Delivery Schedule

Course Duration

- 15 weeks
- 12 Lectures + 2 Revision + 1 Mid Exam

Practical

- Mandatory 1 × 2 hour practical per week

Tutorials

- 1 × 1 hour tutorial per week (we'll notify you) Answers will be discussed ONLY during the Tutorial class.

Evaluation Criteria

Formal Exam - 60% - (3 hour paper)

In course Assignments - 40% - (Quizzes, Assignments, Tutorials)

Recommended Texts

Fundamentals of Database Systems' by Elmasri/Navathe

'Database Systems: A practical approach to design, implementation and management' by Connolly and Begg

Road Map

DB Concepts

Introduction to DBMS

Database Architecture

Data Models

Database Design Methodology

- Conceptual Model
- Logical Model
- Physical Model

Cont’d

Entity Relationship Diagrams

- Entities
- Relations
- Attributes

Mapping Conceptual model into Relational Schema

Data Normalization

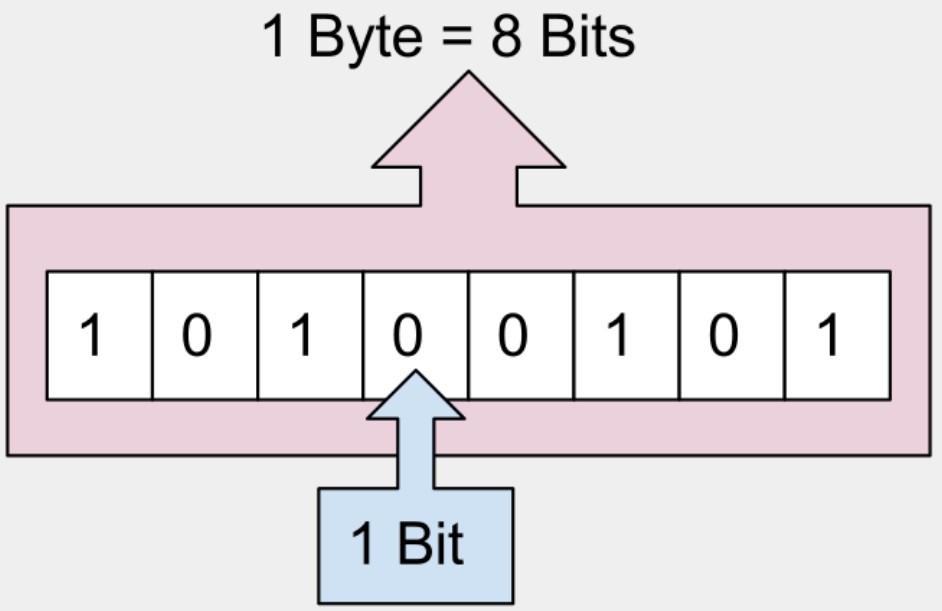
- INF
- 2NF
- 3NF

SQL

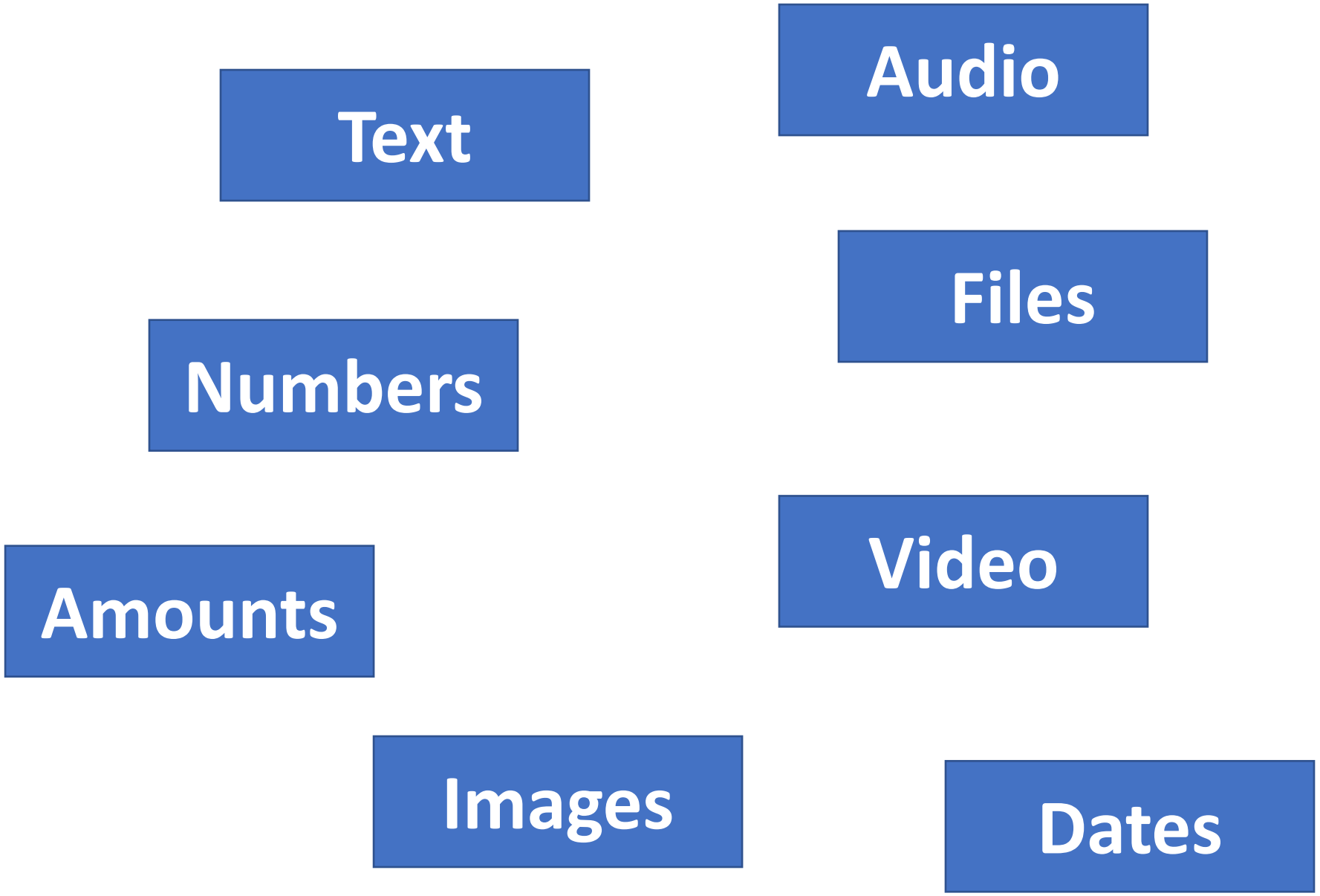
Data vs. Information…

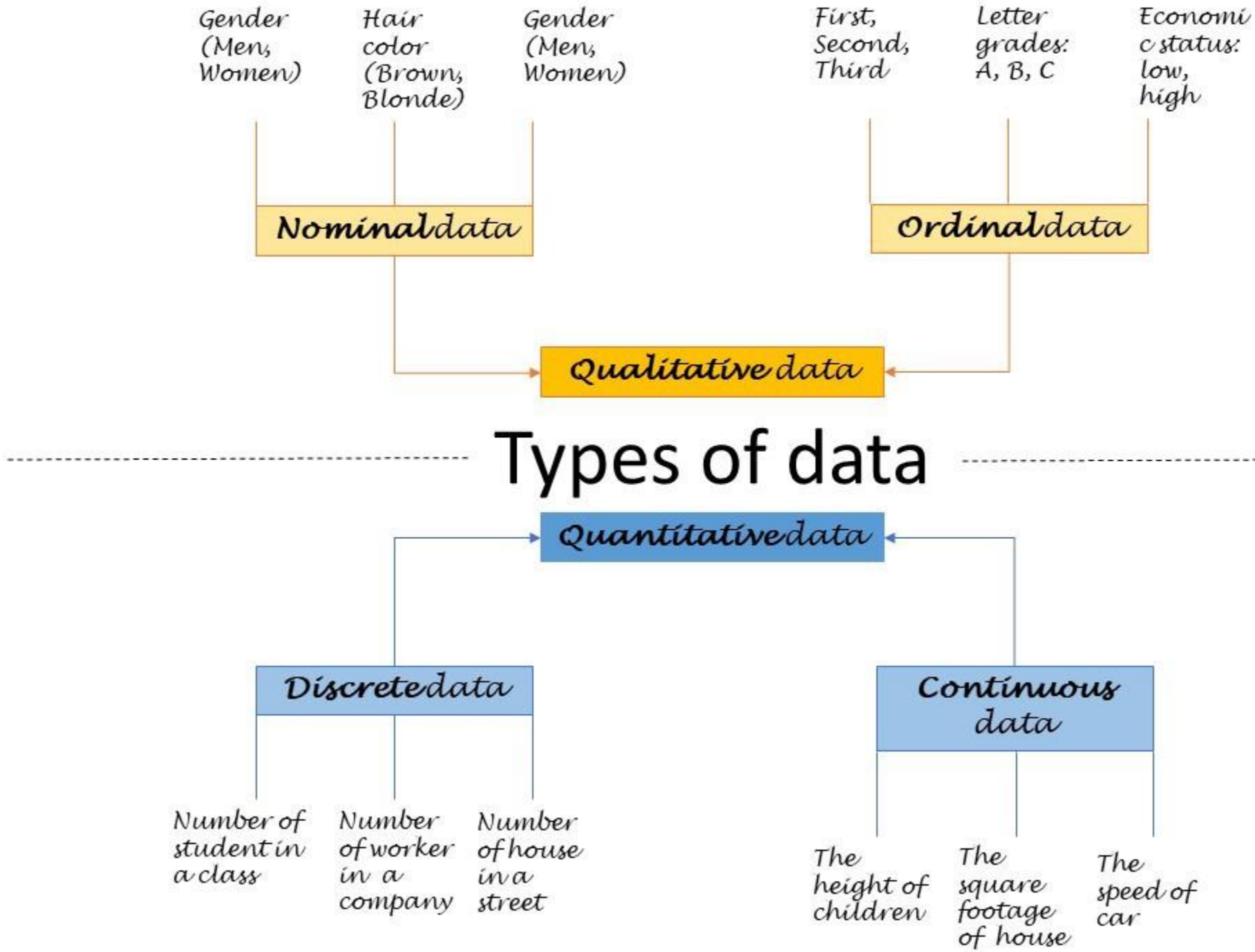
What is Data?

- Data is a collection of raw, unorganized facts and details like text, observations, figures, symbols and descriptions of things etc.
- In other words, data **does not carry any specific purpose** and has **no significance** by itself.
- Moreover, data is measured in terms of bits and bytes – which are basic units of information in the context of computer storage and processing

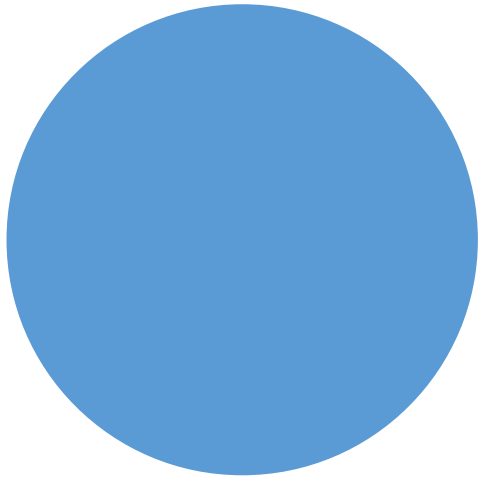
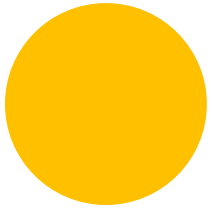


1 byte	= 8 bits
1 kilobyte	= 1024 bytes
1 megabyte	= 1024 kilobyte
1 gigabyte	= 1024 megabyte
1 terabyte	= 1024 gigabyte


Text
Audio
Files
Numbers
Video
Amounts
Images
Dates

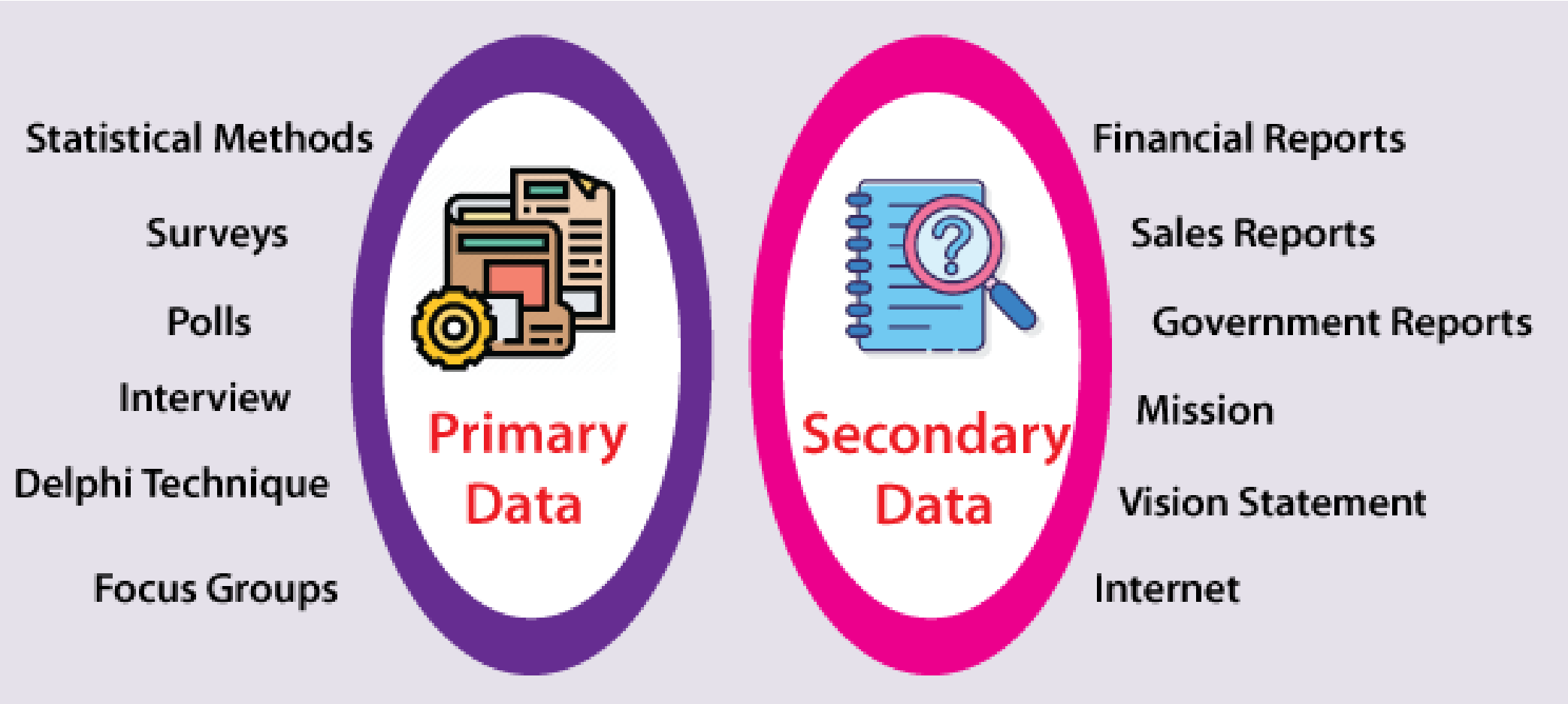


info@entango.net

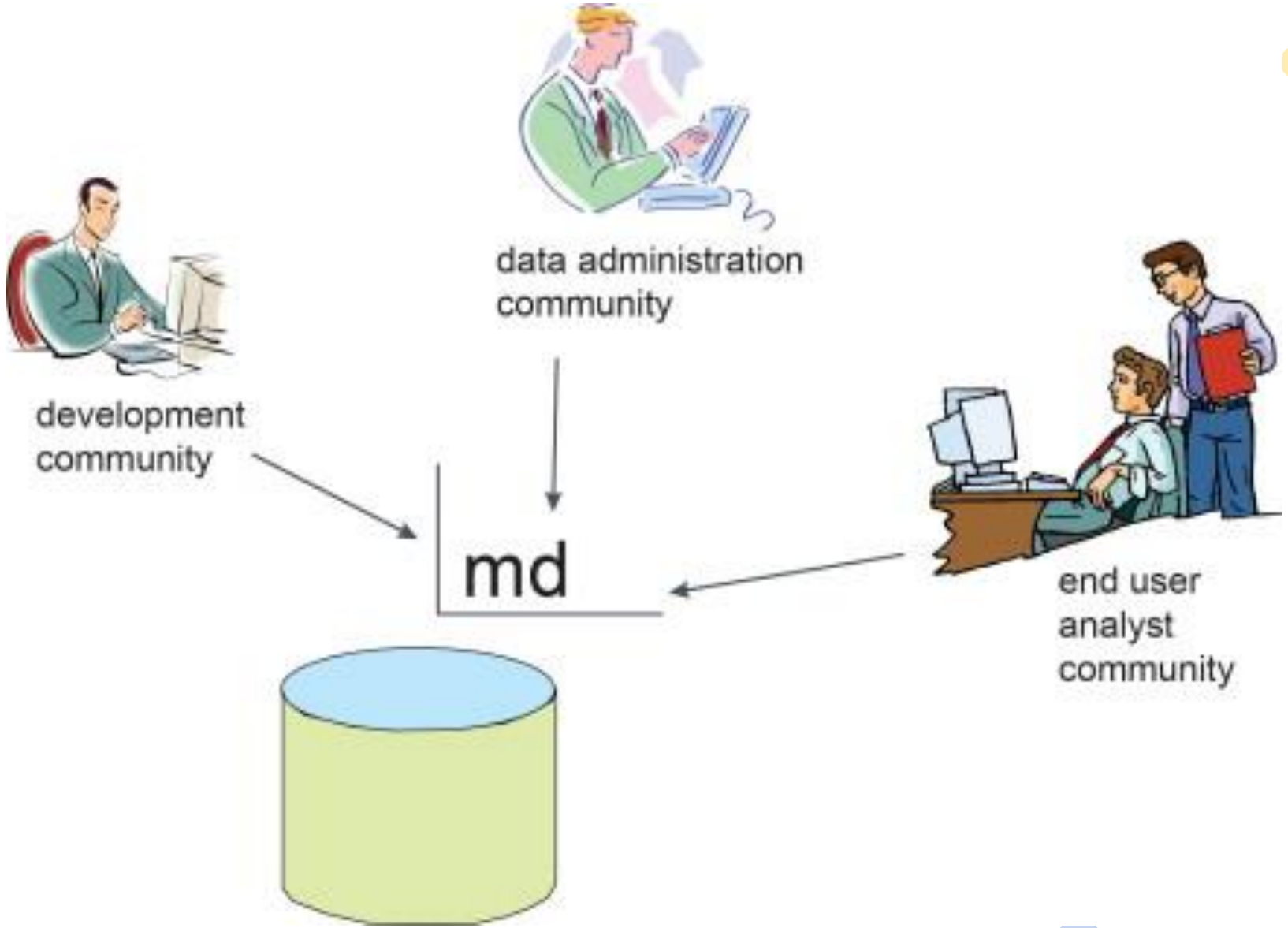



Data is generated manually and automatically

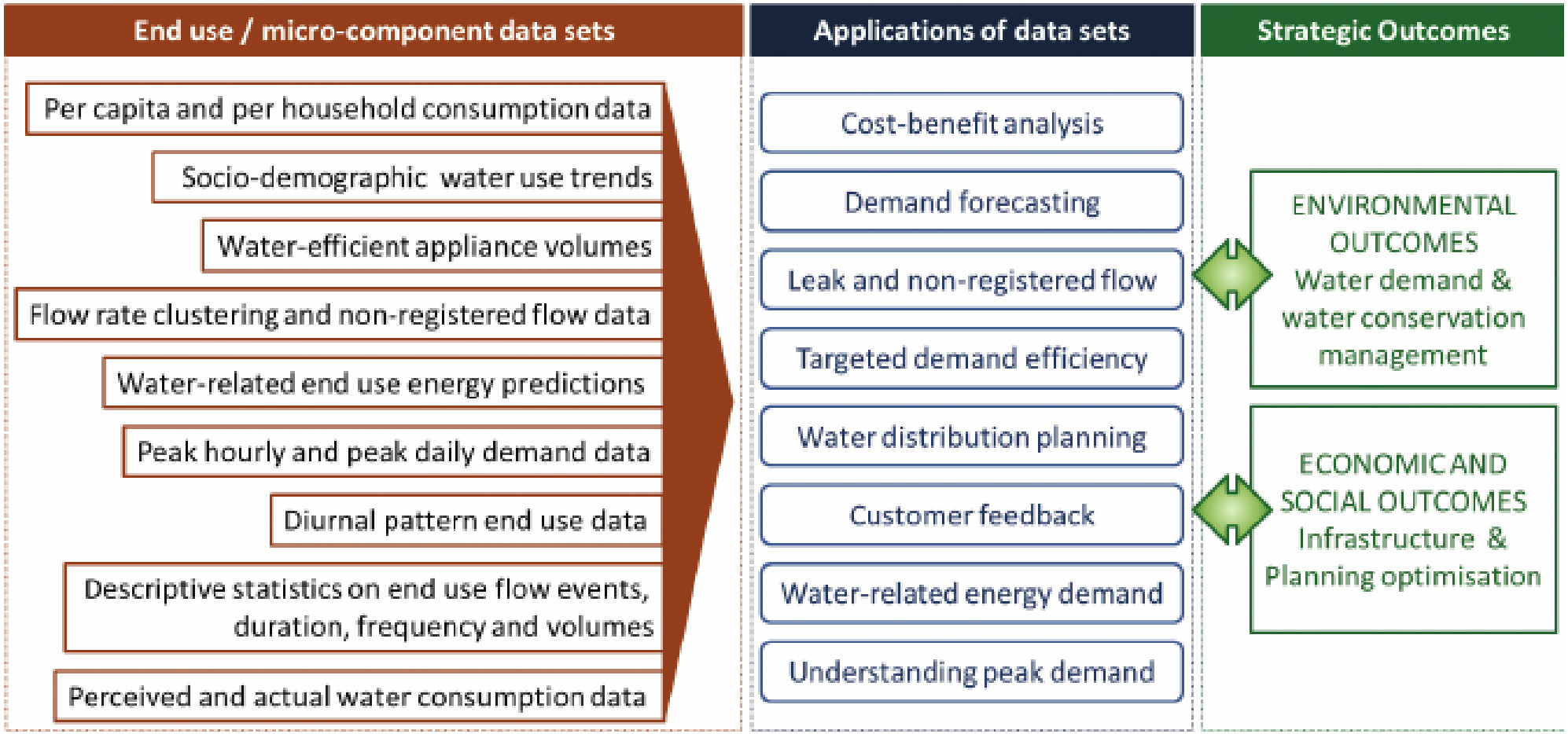
Sources of Data



Data is used (consumed) by end-users and different applications


data administration
community
development
community
md
end user
analyst
community

Examples


End use / micro-component data sets
Per capita and per household consumption data
Socio-demographic water use trends
Water-efficient appliance volumes
Flow rate clustering and non-registered flow data
Water-related end use energy predictions
Peak hourly and peak daily demand data
Diurnal pattern end use data
Descriptive statistics on end use flow events, duration, frequency and volumes
Perceived and actual water consumption data
Applications of data sets
Cost-benefit analysis
Demand forecasting
Leak and non-registered flow
Targeted demand efficiency
Water distribution planning
Customer feedback
Water-related energy demand
Understanding peak demand
Strategic Outcomes
ENVIRONMENTAL OUTCOMES
Water demand & water conservation management
ECONOMIC AND SOCIAL OUTCOMES
Infrastructure & Planning optimisation

If You Have Data, Do You Need a Database to store them ???

What if I can do it..?

- **Using Text File or Spreadsheets**

Size of Data

Scalability??

Ease of Updating

Multiple Access??

Accuracy

Validation??

Security

Access/Privacy??

Redundancy

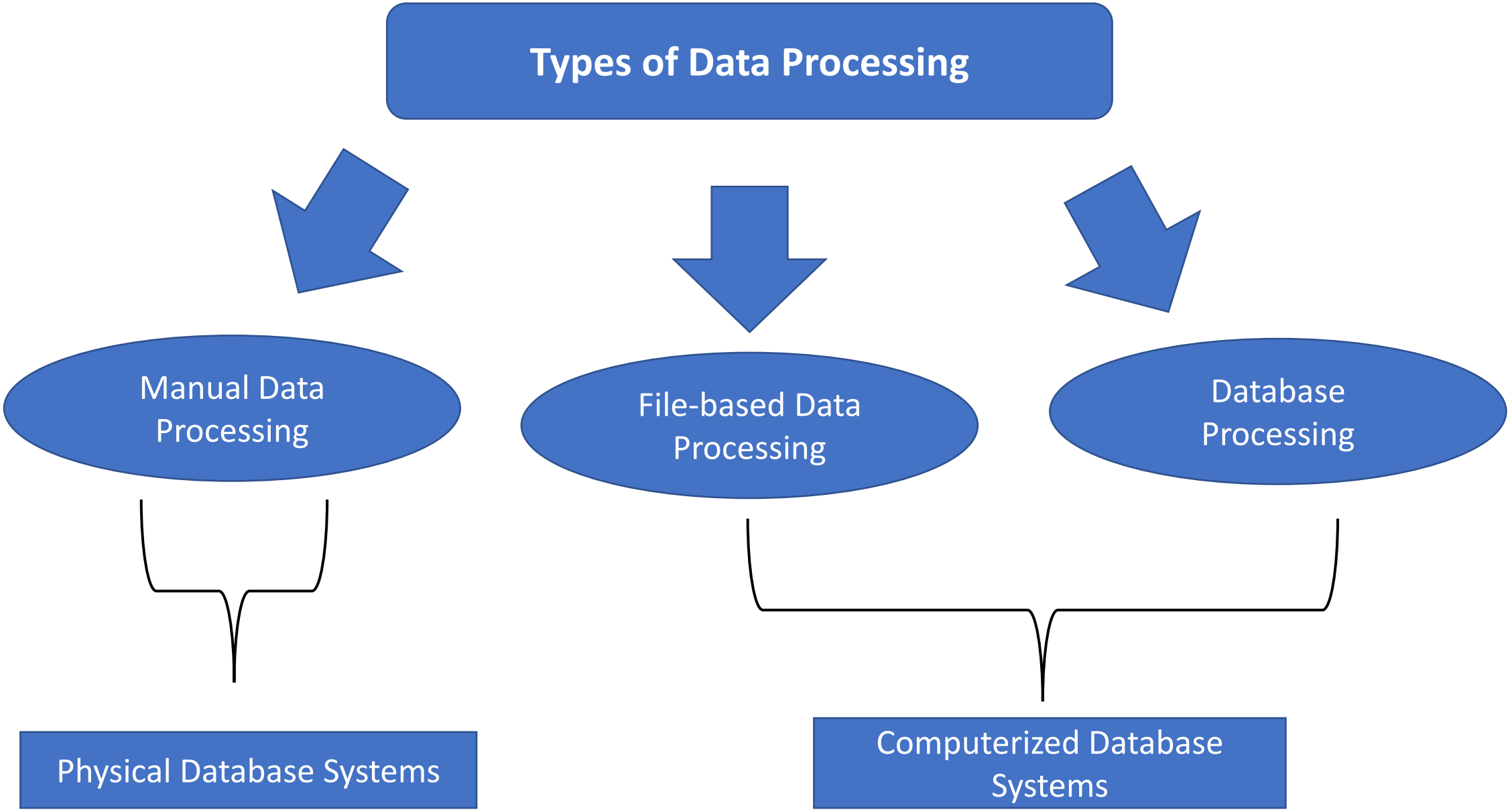
Multiple Copies??

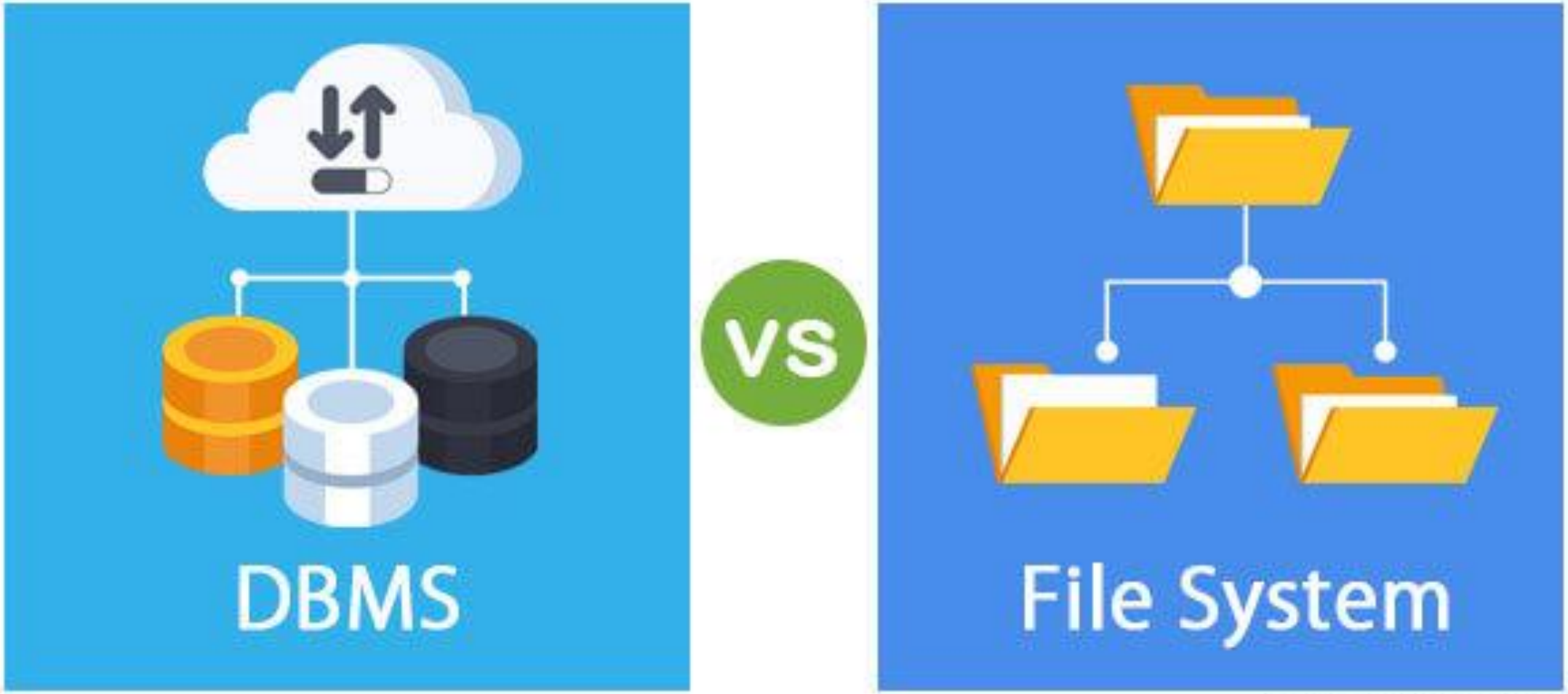
Incomplete

Integrity??

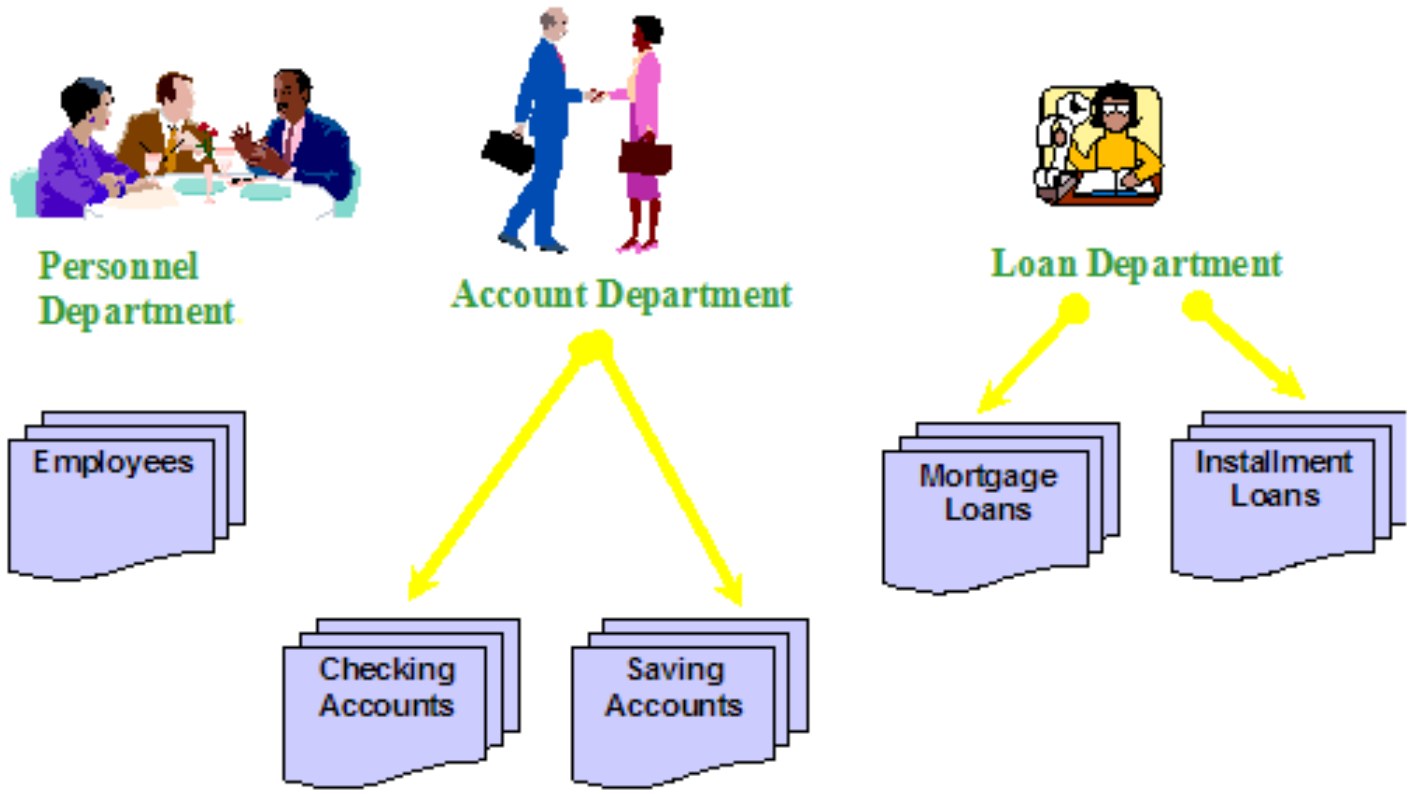
Traditional

- Traditional Applications:
  - Numeric and Textual Databases
- More Recent Applications:
  - Multimedia Databases
  - Geographic Information Systems (GIS)
  - Data Warehouses
  - Real-time and Active Databases
  - Many other applications


Types of Data Processing
Manual Data Processing
File-based Data Processing
Database Processing
Physical Database Systems
Computerized Database Systems


DBMS
VS
File System
www.educba.com

File Based Processing



File-Based Systems

The systems that are used to organize and maintain data files are known as file-based data systems.

These file systems are used to handle a single or multiple files and are not very efficient.

Advantages of File Based system

The file Based system is not complicated and is simpler to use.

Because of the above point, this system is quite inexpensive.

Because the file-based system is simple and cheap, it is normally suitable for home users and owners of small businesses.

Since the file-based system is used by smaller organizations or individual users, it stores comparatively lesser amount of data. Hence, the data can be accessed faster and more easily.

Disadvantages of File Based System

The File based system is limited to a smaller size and cannot store large amounts of data.

This system is relatively uncomplicated, but this means it cannot support complicated queries, data recovery etc.

There may be redundant data in the file-based system as it does not have a complex mechanism to get rid of it.

The data is not very secure in a file-based system and may be corrupted or destroyed.

The data files in the file-based system may be stored across multiple locations. Consequently, it is difficult to share the data easily with multiple users.

Cont’d

- Limited data Mapping and Access
- Data Redundancy
- Data Dependence
- Data inconsistency
- Data Isolation
- Security is less
- Integrity is limited
- Concurrent Access is limited

Database Concepts

- The need of database systems arose in the early 1960s in response to the traditional file processing system.

- In the **file processing system**, the data is stored in the form of files, and a number of application programs are written by programmers to add, modify, delete, and retrieve data to and from appropriate files.

- New application programs are written when needed by the organization.

Database

- A database..
  - Is a miniworld.
  - Is a logically coherent collection of data with some inherent meaning.
  - Is designed, built, and populated with data for a specific purpose.

Different Definitions

A database is an organized collection of structured information, or data, typically stored electronically in a computer system.

A database is usually controlled by a database management system (DBMS).

Together, the data and the DBMS, along with the applications that are associated with them, are referred to as a database system, often shortened to just database.

What is Database

A database is a systematic collection of data.

They support electronic storage and manipulation of data.

Databases make data management easy.

- Example: An online telephone directory uses a database to store data of people, phone numbers, and other contact details.
- Your electricity service provider uses a database to manage billing, client-related issues, handle fault data, etc.
- Facebook. It needs to store, manipulate, and present data related to members, their friends, member activities, messages, advertisements, and a lot more.

Simple Databases

COURSE

Course_name	Course_number	Credit_hours	Department
Intro to Computer Science	CS1310	4	CS
Data Structures	CS3320	4	CS
Discrete Mathematics	MATH2410	3	MATH
Database	CS3380	3	CS

SECTION

Section_identifier	Course_number	Semester	Year	Instructor
85	MATH2410	Fall	04	King
92	CS1310	Fall	04	Anderson
102	CS3320	Spring	05	Knuth
112	MATH2410	Fall	05	Chang
119	CS1310	Fall	05	Anderson
135	CS3380	Fall	05	Stone

GRADE_REPORT

Student_number	Section_identifier	Grade
17	112	B
17	119	C
8	85	A
8	92	A
8	102	B
8	135	A

PREREQUISITE

Course_number	Prerequisite_number
CS3380	CS3320
CS3380	MATH2410
CS3320	CS1310

es

Examples of simple database applications

- On-Demand Online Video Streaming
- Personal Cloud storages
- POS systems in supermarkets
- Different governmental Institutions
- Banks
- Library
- University
- School Databases

DB Vs DBMS

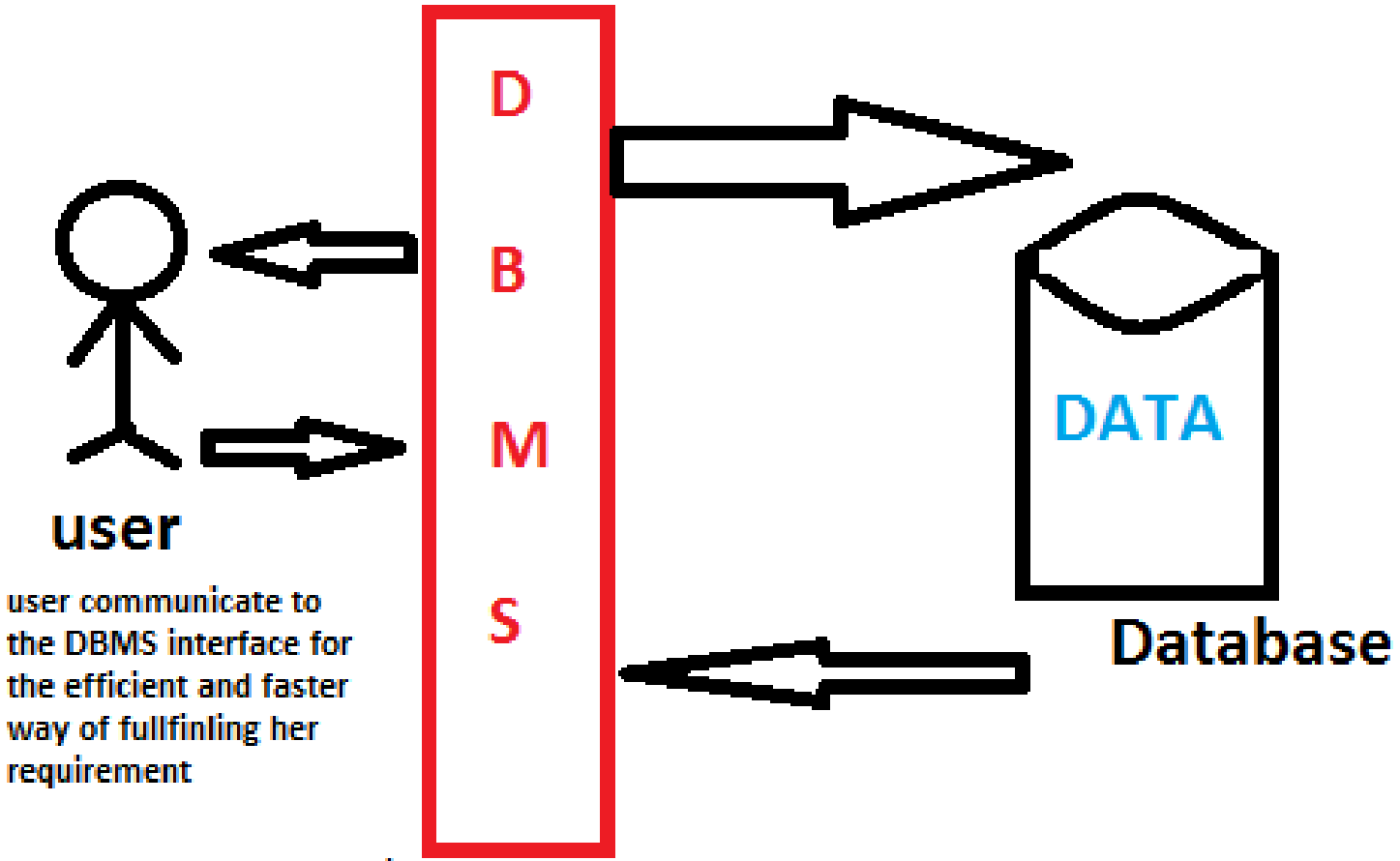
What is a database?

- Collection of data related in some way.
- Student database/University/School database

What is a Database Management System?

A Program to manage large Databases providing

- reliable and efficient access to data
- General-purpose software system that facilitates the processes of defining, constructing, manipulating, and sharing databases among various users and applications.
- Not required always

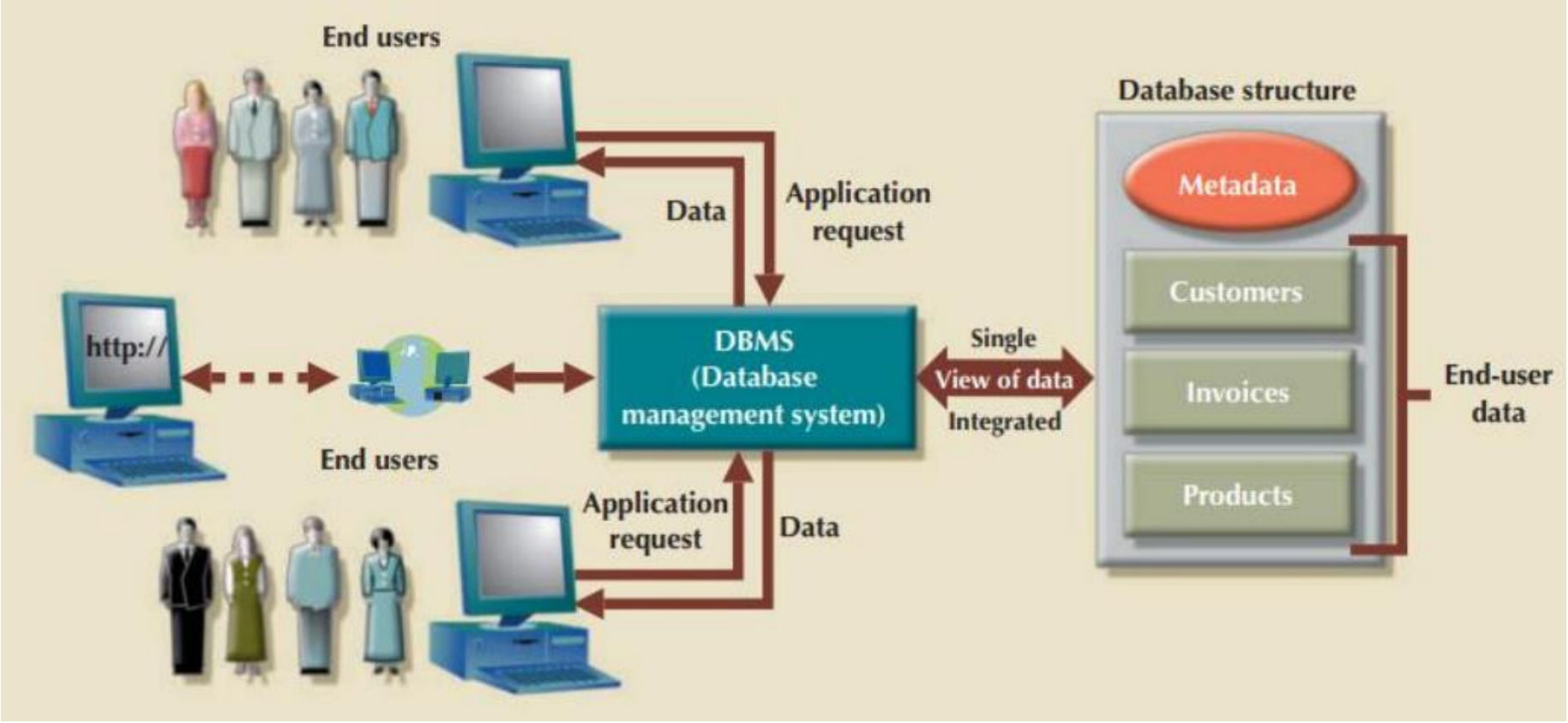


user communicate to the DBMS interface for the efficient and faster way of fullfinling her requirement

Different programs to insert , delete , update and query database for information

Database Management Systems

The DBMS manages the interaction between the end user and the database



Typical Functions of Database systems

- **Define** a particular database in terms of its data types, structures, and constraints
- **Construct or Load** the initial database contents on a secondary storage medium
- **Manipulating** the database:
  - Retrieval: Querying, generating reports
  - Modification: Insertions, deletions and updates to its content
  - Accessing the database through Web applications
- **Processing and Sharing** by a set of concurrent users and application programs