1- Introduction of Data base and Data Analyses

In this chapter, you will learn:
- The difference between data and information.
- What a database is, the various types of databases, and why they are valuable. assets for decision making.
- The importance of database design.
- About flaws in file system data management.
- The main components of the database system.
- The main functions of a database management system (DBMS).

1.1 WHY DATABASES?

Imagine trying to operate a business without knowing who your customers are, what products you are selling, who is working for you, who owes you money, and whom you owe money. All businesses have to keep this type of data and much more; and just as importantly, they must have those *data available to decision makers* when they need them. Depending on the type of information system and the characteristics of the business, these data could vary from a few megabytes on just one or two topics to terabytes covering hundreds of topics within the business's internal and external Environment. For example, the telecommunications companies such as Sprint and AT&T are known to have systems that keep data on trillions of phone calls.

Now, The main quires as follows:

How can these businesses process this much data?

How can they store it all, and then quickly retrieve just the facts that decision makers want to know, just when they want to know it?

The answer is that they use databases. Databases, as explained in detail throughout this course, are specialized structures that allow computer-based systems to *store, manage, and retrieve data very quickly.*

1.2 DATA VS. INFORMATION

To understand what drives database design, you must understand the difference between data and information. **Data** are raw facts. The word raw indicates that the facts have not yet been processed to reveal their meaning. For example, suppose that you want to know what the users of a **Data base lab** think of its services. You should be follows the following steps:

1- Take the name of students from the secretaries of computer science Dept.
2- Upload all questions to the Data base course website that require answers from students to know the problems of each student.
3- Put the main plan for solve students' problems.

We notice, the row data coverts to the more details data called **information**.

Information is the result of processing raw data to reveal its meaning. Data processing can be as simple as organizing data to reveal patterns or as complex as making forecasts or drawing inferences using statistical modeling. To reveal meaning, information requires context.

For example, an average temperature reading of 105 degrees does not mean much unless you also know its context: **Is this in degrees Fahrenheit or Celsius? Is this a machine**

temperature, a body temperature, or an outside air temperature? Information can be used as the foundation for decision making.

1.3 INTRODUCING THE DATABASE

A database is a shared, integrated computer structure that stores a collection of:
- **End-user data**, that is, raw facts of interest to the end user.
- **Metadata**, or **data about data**, through which the end-user data are integrated and managed. The metadata provide *a description of the data characteristics and the set of relationships* that links the data found within the database. For example, the metadata component stores information such as the following:
    1- Name of each data element.
    2- The type of values (numeric, dates, or text) stored on each data element, whether or not the data element can be left empty, and so on.
    In short, metadata present a more complete picture of the data in the database.

A **database management system** (DBMS) is a collection of programs that manages the database structure and controls access to the data stored in the database.

### Role and Advantages of the DBMS
The Role of DBMS as follows:
1- The DBMS serves as the intermediary between the user and the database.
2- The database structure itself is stored as a collection of files, and the only way to access the data in those files is through the DBMS.
3- The DBMS receives all application requests and translates them into the complex operations required to fulfill those requests.
4- The DBMS hides much of the database's internal complexity from the application programs and users.

DBMS provides advantages such as:
1- Improved data sharing. The DBMS helps create an environment in which end users have better access to more and better-managed data.
2- Improved data security. The more users access the data, the greater the risks of data security breaches. Corporations invest considerable amounts of time, effort, and money to ensure that corporate data are used properly.
3- Better data integration. Wider access to well-managed data promotes an integrated view of the organization's operations and a clearer view of the big picture.
4- Improved data access. The DBMS makes it possible to produce quick answers to ad hoc queries. From a database perspective, a query is a specific request issued to the DBMS for data manipulation—for example, to read or update the data. Simply put, a query is a question, and an ad hoc query is a spur-of-the-moment question. The DBMS sends back an answer (called the query result set) to the application.
5- Improved decision making. Better-managed data and improved data access make it possible to generate better-quality information, on which better decisions are based.

6- Increased end-user productivity. The availability of data, combined with the tools that transform data into usable information, empowers end users to make quick, informed decisions that can make the difference between success and failure in the global economy.

Figure 1. Explain the Role and Advantages Of DBMS.
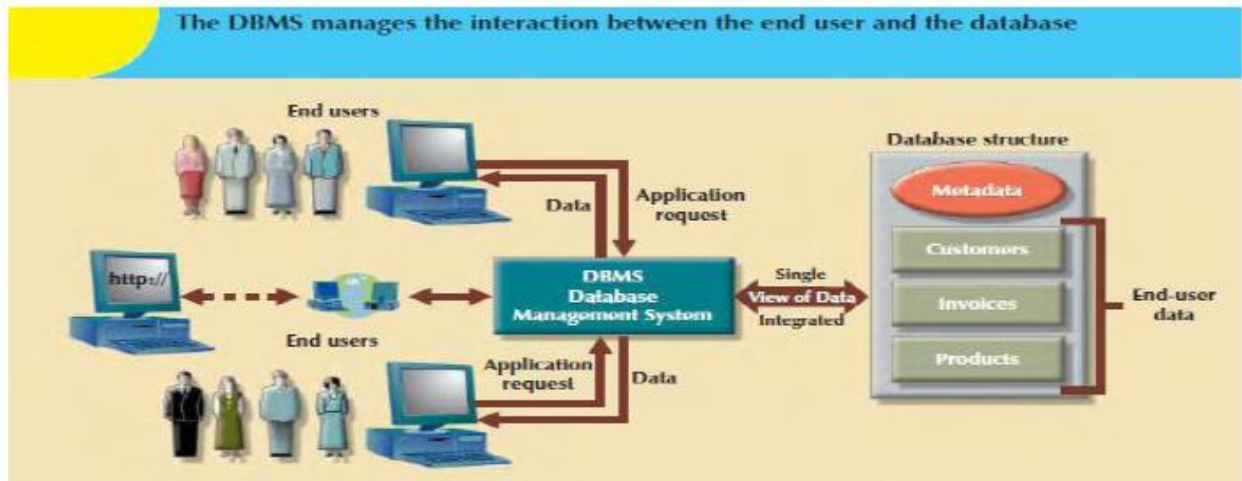
1.3.2 Types of Databases

A DBMS can support many different types of databases. Databases can be classified according to the **number of users**, the **database location(s)**, and the **expected type** and **extent of use**.

The number of users determines whether the database is classified as *single-user* or *multiuser*.

1- A **single-user database** supports only one user at a time. In other words, if user A is using the database, users B and C must wait until user A is done. A single-user database that runs on a **personal computer** is called a **desktop database**.

2- **Multiuser database** supports multiple users at the same time. When the multiuser database supports a relatively small number of users (*usually fewer than 50*) or a specific department within an organization, it is called a **workgroup database**. When the database is used by the entire organization and supports many users (*more than 50, usually hundreds*) across many departments, the database is known as an **enterprise database**.

Database location might also be used to classify the database.

For example, a database that supports data located at a single site is called a *centralized database*. A database that supports data distributed across several different sites is called a *distributed database*.

Note:

1- The most popular way of classifying databases today however, is based on how they will be used and on the *time sensitivity of the information* gathered from them. A database that is designed primarily to support a company's *day-to-day* operations is classified as an operational database (*sometimes referred to as a transactional or production database*). In contrast, a data *warehouse* focuses

primarily on storing data used to generate information required to make *tactical* or *strategic* decisions.

2- Databases can also be classified to reflect the degree to which the data are structured.
   - ✓ Unstructured data are data that exist in their original (raw) state.
   - ✓ **Structured data** are the result of taking **unstructured data** and **formatting (structuring)** such data to facilitate storage, use, and the generation of information. You apply structure (**format**) based on the type of processing that you intend to perform on the data.
   - ✓ **Semistructured data** are data that have already been processed to some extent. For example, if you look at a typical Web page, the data are presented to you in a prearranged format to convey some information.

The following flow chat explains the types of data bases:
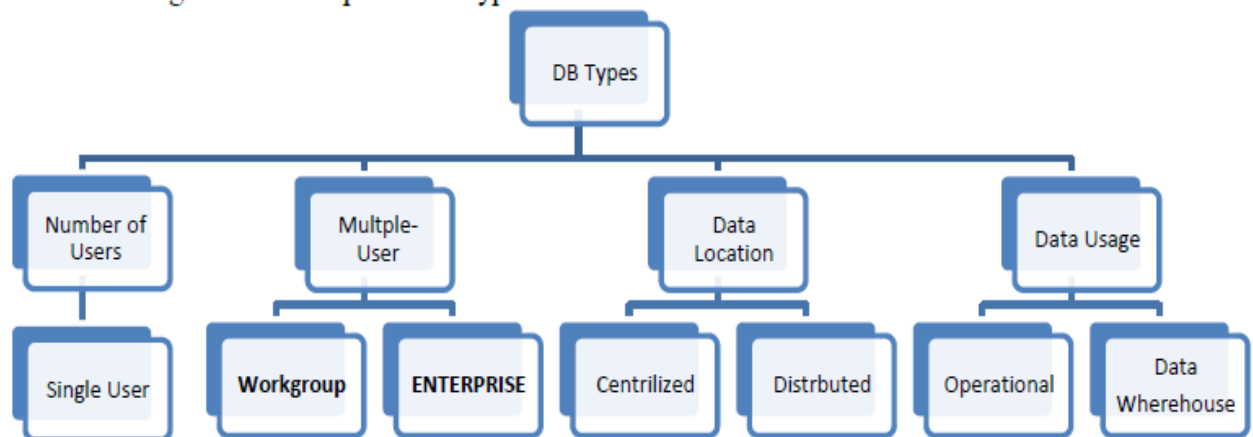
1.4 WHY DATABASE DESIGN IS IMPORTANT

Database design refers to the activities that focus on the design of the database structure that will be used to store and manage end-user data. A database that meets all user requirements does not just happen; its structure must be designed carefully.

1.5 FILE SYSTEM & DATA PROCESSING

- ✓ **Manual File Systems**

   Historically, such systems were often manual, paper-and-pencil systems. The papers within these systems were organized in order to facilitate the expected use of the data. Typically, this was accomplished through a system of file folders and filing cabinets.

- ✓ **Computerized File Systems**

   A data processing (DP) specialist was hired to create a computer-based system that would track data and produce required reports.

Notes:

1- From the DP specialist's perspective, the computer files within the file system were created to be similar to **the manual files**. Data management programs were created to **add to**, **update**, and **delete data** from the **file**.

2- From the end user's perspective, the systems separated the users from the data. As the users' competitive environment pushed them to make more and more