

# Introduction to Databases

## Before the Advent of Database Systems –

### 1- File System

One way to keep information on a computer is to store it in permanent files. A company system has a number of application programs; each of them is designed to manipulate data files. These application programs have been written at the request of the users in the organization. New applications are added to the system as the need arises. The system just described is called the **file-based system**.

### 1-1 Disadvantages of the File System

#### 1- Data redundancy

Often, within an organization, files and applications are created by different programmers from various departments over long periods of time. This can lead to *data redundancy*, this practice can lead to several problems such as:

- Inconsistency in **data format**.
- The same information being kept in several different places (files)
- *Data inconsistency*, a situation where various copies of the same data are conflicting.

#### 2- Data isolation

It is difficult for new applications to retrieve the appropriate data, which might be stored in various files.

#### 3- Integrity problems

Data values must satisfy certain consistency constraints that are specified in the application programs.

#### **4- Security problems**

There are constraints regarding accessing privileges.

#### **5- Concurrency access**

A file-based system must manage, or prevent, concurrency by the application programs. Typically, in a file-based system, when an application opens a file, that file is locked. This means that no one else has access to the file at the same time. In database systems, concurrency is managed thus allowing multiple users access to the same record. This is an important difference between database and file-based systems.

#### **2- Database Approach**

The difficulties that arise from using the file-based system have prompted the development of a new approach in managing large amounts of information called the *database approach*.

Database and database technology have major impact on the growing use of computer. database play a critical role in almost all areas where computer are used, including business, electronic commerce, engineering, law, education, and library science.

**Database (DB):** Is a collection of interrelated data stored together without harmful or unnecessary redundancy to serve multiple applications, the data stored so that they are independent of the applications which use it.

#### **3- Database Properties**

A database has the following properties:

1- It is a representation of some aspect of the real world or a collection of *data elements (facts)*. we mean known facts that can be recorded and that

have implicit meaning. For example, names, telephone numbers, and addresses of the people

2- A database is a logically coherent collection of data . A random assortment of data cannot be referred to as database.

3- A database is designed, built, and populated with data for a specific purpose. It has an intended group of users.

#### **4- Characteristics and Benefits of a Database**

##### **1- Self-describing nature of a database system**

A database system is referred to as *self-describing* because it not only contains the database itself, but also *metadata* which defines and describes the data and relationships between tables in the database. This separation of data and information about the data makes a database system totally different from the traditional file-based system in which the data definition is part of the application programs.

##### **2- Insulation between program and data**

In the file-based system, the structure of the data files is defined in the application programs so if a user wants to change the structure of a file, all the programs that access that file might need to be changed as well.

On the other hand, in the database approach, the data structure is stored in the system catalogue and not in the programs. This insulation between the programs and data is also called program-data independence.

##### **3- Support for multiple views of data**

A database supports multiple views of data. A *view* is a subset of the database, which is defined and dedicated for particular users of the system. Multiple users in the system might have different views of the

system. Each view might contain only the data of interest to a user or group of users.

#### **4- Sharing of data and multiuser system**

Current database systems are designed for multiple users. That is, they allow many users to access the same database at the same time. This access is achieved through features called *concurrency control strategies*. These strategies ensure that the data accessed are always correct and that data integrity is maintained.