DBMS

- **Data**
  - Data is raw fact or figures or entity, from which required information is produced.
  - When activities in the organization takes place, the effect of these activities need to be recorded which is known as Data.
  - For example, names, telephone numbers and addresses of the people
  - known facts that can be recorded and that have implicit meaning
- **Information**
  - Processed data is called information
  - The purpose of data processing is to generate the information required for carrying out the business activities.

1. Tasks in data management

• **Data capture:** Which is the task associated with gathering the data as and when they originate.
• **Data classification**: Captured data has to be classified based on the nature and intended usage.
• **Data storage:** The segregated data has to be stored properly.
• **Data arranging**: It is very important to arrange the data properly
• **Data retrieval:** Data will be required frequently for further processing. Hence it is very important to create some indexes so that data can be retrieved easily
• **Data maintenance:** Maintenance is the task concerned with keeping the data upto-date.
• **Data Verification:** Before storing the data it must be verified for any error.
• **Data Coding**: Data will be coded for easy reference.
• **Data Editing**: Editing means re-arranging the data or modifying the data for presentation.
• **Data transcription**: This is the activity where the data is converted from one form into another.
• **Data transmission:** This is a function where data is forwarded to the place where it would be used further.

2. Metadata

- **Metadata** (meta data, or sometimes meta information) is "data about data", of any sort in any media.
- An item of metadata may describe a collection of data including multiple content items and hierarchical levels, for example a database schema.
- Eg: A text document's metadata may contain information about how long the document is, who the author is, when the document was written, and a short summary of the document.
- Metadata within web pages can also contain descriptions of page content, as well as key words linked to the content.[14] These links are often called "Metatags",

3. Applications of DBMS

The primary goal of a DBMS is to provide an environment that is both convenient and efficient for people to use in retrieving and storing information.

Database are widely used. The some of the representative applications are:

1. **Banking :** for customer information, accounts and loans and banking transactions.
2. **Universities :** for student registrations and grades.
3. **Online shopping :** Everyone wants to shop from home. Everyday new products are added and sold only with the help of DBMS. Purchase information, invoice bills and payment, all of these are done with the help of DBMS.
4. **Airlines :** for reservations and schedule information.
5. **Credit card transactions :** for purchases on credit cards and generation of monthly statements.
6. **Library Management System :** maintain all the information relate to book issue dates, name of the book, author and availability of the book.
7. **Telecommunications :** for keeping records of call made, generating monthly bills, maintaining balances on prepaid calling cards.
8. **Sales :** for customer, product and purchase information.
9. **Finance :** for storing information about holdings, sales, and purchases of financial instruments such as stocks and bonds.
10. **Manufacturing :** for management of supply chain and for tracking production of items in factories, inventories of items and orders for items.
11. **Human Resource :** for information about employees, salaries, payroll taxes and benefits.

4. Database

• Database may be defined in simple terms as a collection of data
• A database is a collection of related data.
• The database can be of any size and of varying complexity.
• A database may be generated and maintained manually or it may be computerized.

Database Management System - A Database Management System (DBMS) is a collection of program that enables user to create and maintain a database.
Def : general-purpose software system that facilitates the processes of defining, constructing, manipulating, and sharing databases among various users and applications.

Defining a database involves specifying the data types, structures, and constraints for the data to be stored in the database.
Constructing the database is the process of storing the data itself on some storage medium that is controlled by the DBMS.
Manipulating a database includes such functions as querying the database to retrieve specific data, updating the database as required, and generating reports from the data.
Sharing a database allows multiple users and programs to access the database concurrently.
Maintaining A typical large database may have a life cycle of many years, so the DBMS must be able to maintain the database system by allowing the system evolve as requirements change over time.
Protection includes both *system protection* against hardware or software malfunction (or crashes), and *security protection* against unauthorized or malicious access.

5. Functions of DBMS

• **Data Definition**: The DBMS provides functions to define the structure of the data in the application. These include defining and modifying the record structure, the type and size of fields and the various constraints to be satisfied by the data in each field.
• **Data Manipulation:** Once the data structure is defined, data needs to be inserted, modified or deleted. These functions which perform these operations are part of DBMS.
• **Data Security & Integrity**: The DBMS contains modules which handle the security and integrity of data in the application.

• **Data Recovery and Concurrency**: Recovery of the data after system failure and concurrent access of records by multiple users is also handled by DBMS.
• **Data Dictionary Maintenance:** Maintaining the data dictionary which contains the data definition of the application is also one of the functions of DBMS.
• **Performance:** Optimizing the performance of the queries is one of the important functions of DBMS.

6. Advantages of DBMS

1. Data independency:

Application program should not be exposed to details of data representation and storage DBMS provides the abstract view that hides these details.

2. Controlling of Redundancy:

Data redundancy refers to the **duplication of data (i.e storing same data multiple times).** In a database system, by having a centralized database and centralized control of data by the DBA the unnecessary duplication of data is avoided. It also eliminates the extra time for processing the large volume of data. It results in saving the storage space.

3. Improved Data Sharing:

DBMS allows a user to share the data in any number of application programs.

4. Data Integrity:

Data integrity is the overall completeness, accuracy and consistency of data. For example a bank maintains separate customer files for each type of account, when a customer moves to a new address, his/her address field must be updated in all customer files containing this customer record.

Integrity of data is necessary to avoid confusion that may result when one file is updated while others are not.

Data is accessed through DBMS, it can enforce integrity constraints.

E.g.: Inserting salary information for an employee.

5. Security:

Having complete authority over the operational data, enables the DBA in ensuring that the only mean of access to the database is through proper channels. The DBA can define authorization

checks to be carried out whenever access to sensitive data is attempted.

6. Data Consistency:

By eliminating data redundancy, we greatly reduce the opportunities for inconsistency. For example: is a customer address is stored only once, we cannot have disagreement on the stored values. Also updating data values is greatly simplified when each value is stored in one place only. Finally, we avoid the wasted storage that results from redundant data storage.

7. Efficient Data Access:

DBMS utilizes a variety of sophisticated techniques to store and retrieve data efficiently.

In a database system, the data is managed by the DBMS and all access to the data is through the DBMS providing a key to effective data processing

8. Enforcements of Standards:

With the centralized of data, DBA can establish and enforce the data standards which may include the naming conventions, data quality standards etc.

9. Reduced Application Development and Maintenance Time:

DBMS supports many important functions that are common to many applications, accessing data stored in the DBMS, which facilitates the quick development of application.

10. Data Administration:

When users share data, centralizing the data is an important task, Experience professionals can minimize data redundancy and perform fine tuning which reduces retrieval time.

11. Concurrent access and Crash recovery:

DBMS schedules concurrent access to the data. DBMS protects user from the effects of system failure.

8. Disadvantages of DBMS

1. Increased Complexity
2. Requirement of New and Specialized Manpower
3. Large Size of DBMS
4. Increased installation and management cost
5. Additional hardware cost
6. Conversion cost
7. Need for explicit backup and recovery
8. Organizational conflict

9. Database System versus File System

File System	DBMS
1. File system is a collection of data. Any management with the file system, user has to write the procedures	1. DBMS is a collection of data and user is not required to write the procedures for managing the database.
2. File system gives the details of the data representation and Storage of data.	2. DBMS provides an abstract view of data that hides the details.
3. In File system storing and retrieving of data cannot be done efficiently.	3. DBMS is efficient to use since there are wide varieties of sophisticated techniques to store and retrieve the data.
4. Concurrent access to the data in the file system has many problems like a. Reading the file while other deleting some information, updating some information	4. DBMS takes care of Concurrent access using some form of locking.
5. File system doesn't provide crash recovery mechanism.	5. DBMS has crash recovery mechanism, DBMS protects user from the effects of system failures.
6. Protecting a file under file system is very difficult.	6. DBMS has a good protection mechanism.