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BSIT 3 – 4

1. Importance of Database

Information is everywhere. We gather and use information unknowingly in every day of our lives. By surfing the internet, we can gain knowledge. We encounter so much data, but we cannot memorize all those data. That's why databases play an essential role in managing data. A database is a structured collection of information arranged and frequently stored electronically in a computer system. There are several reasons why the database is essential. First, it allows us to manage data. Instead of writing the data on a piece of paper one by one, databases enable users to add, delete, update, and retrieve data and sort and search for data. Second, the database is reliable as it stores data consistently, preventing it from becoming corrupted. Unlike on paper, when we experience unforeseen circumstances, we cannot easily, or it is impossible to retrieve the data. Third, it allows us to manage extensive data easily, unlike on paper, where we need to write all the data given. Lastly, our data is secured since the database only allows an authorized user to access the information, preventing the unauthorized user from gathering data. We can all agree that a database is essential to our lives, particularly for people who keep private and significant information since they can keep their files organized. No one will have any trouble stealing them.

2. Major Uses of DBMS

- Data independence and efficient access of data.
- Application Development time reduces.
- Security and data integrity.
- Uniform data administration.
- Concurrent access and recovery from crashes.

3. Functions of DBMS

- **Data Dictionary Management** – In a data dictionary, DBMS contains descriptions of the data elements and the relationships between them (metadata). The DBMS also uses the data dictionary to find the required data component structures and recorded any changes made in a database structure.
- **Security Management** – DBMS creates a security system that protects user confidentiality and data privacy. Security rules can control the database's users, the data items that they can access, the data actions (read, add, delete, or edit) they can perform.
- **Multi User Access Control** – Multiple user can access the database continuously without compromising the database's integrity with the help of DBMS' complex algorithms.
- **Backup and Recovery Management** – DBMS provide special utilities that allow the database administrator to perform backup and recovery procedures.
- **Data Integrity Management** – The DBMS encourages and upholds integrity regulations, minimizing data duplication and enhancing data consistency.

- **Database Access Language and Application Programming Interface** – A query language, often known as a database access language, is offered by DBMS. Non-procedural query languages are used to access databases and change data. An example of query language is SQL.
- **Data Storage Management** – The creation and management of complex data databases is one of the most crucial DBMS responsibilities. By giving complex data sets a framework so that users may access and alter them with ease, it relieves the user.
- **Data Transformation and Presentation** – Because DBMSs can alter data, programmers are relieved of the burden of worrying about how the data is logically and physically represented. The data is kept by DBMS in the chosen data structure.

4. Database Access

A well-known database management system made by Microsoft, Microsoft Access is a component of the Microsoft 365 office suite. Software development tools, a graphic user interface (GUI), and Microsoft's relational Jet Database Engine are all included in Microsoft Access. It was first released in November 1992, so it's been around for a while. The best way to characterize a 30-year-old program in the quickly evolving, fast-paced IT industry is as "venerable.

Business and enterprise users may efficiently manage massive volumes of data and conduct analyses with Microsoft Access. For designing simple-to-use forms, the application offers a combination of database functionality and programming abilities.

Similar to Microsoft Excel, Microsoft Access allows you to save, edit, and examine data. Access, though, has a lot more to offer.

5. Benefits and Limitations

Benefits

- **User-friendly Interface** – MS Access has a user-friendly interface that enables drag-and-drop database creation and management. Because of this, creating tables, forms, queries, and reports is simple and doesn't require a lot of technical expertise.
- **Cost-effective** – MS Access is significantly cheaper to implement and maintain compared to larger database management systems such as Oracle and SQL server.
- **Easy to share data** - With the help of MS Access's multi-user capability, you can simultaneously share your database with up to 40 other users. Because of this, any person who has access to your database can edit and make changes. The most recent versions also let you build a web application that lets users use a web browser to update and modify specific elements of the same database.
- **Scalability** – Without having to know SQL, users can query and analyze vast volumes of data using a range of tools and features offered by Microsoft Access.
- **Integration with other Microsoft Products** – Access integrates with other Microsoft Office applications such as Excel, Word, and Outlook, allowing them for smooth data sharing and manipulation.

Limitations

- **File Size Limit** – Access database files have a size limit of 2 gigabytes. This implies that Access might not be the best option for applications requiring vast amounts of data or datasets.
- **User Limit** – Access is intended for small-scale applications. It may have performance concerns when there are many users using it at once (usually more than 20 to 30 users).
- **Less effective Security Measure** – Although Access has some basic security protections, it could not be as secure as advanced database management systems. It lacks reliable solutions for encryption and authentication.
- **Lack of Built-In Version Control** – It may be more difficult to manage changes to the database structure and code over time since Access lacks integrated version control mechanisms.
- **Limited Scalability** – Despite being appropriate for small to medium-sized applications, Access might not be able to meet the demands of really big enterprise-level databases or applications.

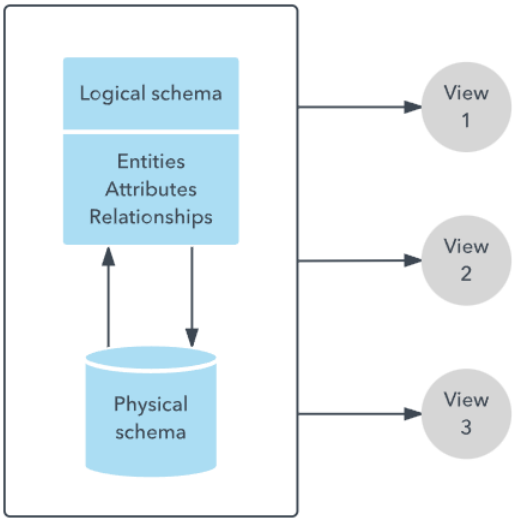
6. Database Characteristics

- **Data Independence** – Has the ability to alter a database's structure without affecting the programs that access the data. This can be done by separating the logical and physical structure of database, which allows the database administrator to make changes to the physical structure without affecting the logical structure.
- **Data Integrity** – refers to the consistency and accuracy of the data in a database. Databases having a large amount of missing data and inaccurate data are said to have poor data integrity.
- **Data Sharing** – refers to a database's capacity for multiple access and change by several users. The database approach makes use of a number of mechanisms, including concurrency control (the process of managing access to the data in the database by multiple users) and locking (the process of preventing other users from accessing a specific piece of data while it is being updated), to secure data sharing.
- **Backup and Recovery** - This is crucial in the event of system failures or other unforeseen circumstances that could result in data loss. The database approach employs a number of methods, including replication, transaction logs, and database backups, to make sure that data can be backed up and restored.
- **Scalability** – This refers to the database's capacity to manage vast amounts of data and numerous users without experiencing performance reduction.
- **Security** – It ensures the data's security against unauthorized access, modification, or destruction. Authentication, authorization, and encryption are only a few of the security measures used by the database method.

7. Database Schema

- The logical way that data is stored in a database is represented by a structure called a database schema. It depicts how data is organized and offers details on the connections between the tables in a certain database.

- An object in a database schema could be a table, field, package, view, relationship, primary key, foreign key, etc.
- The schema does not physically contain the data itself; instead, it provides information on the shape of the data and how it might be related to other tables or models.
- Depending on the scope of the project, the complexity and size of the schema change. Before they begin to code the database, it helps developers in easily managing and structuring it.
- **Types of Database Schema**
  1. **Logical Schema** – All of the logical restrictions that must be applied to the stored data are specified in the logical database structure. The views, integrity restrictions, and table are all defined. The logical schema shows how the characteristics of a table are connected to one another and how the data is stored as tables.
  2. **Physical Schema** – specifies how the data is stored physically on a storage system or disk storage in the form of Files and Indices.



- **Database Schema Designs**
  - **Flat Model** – A flat model schema is a kind of 2-D array in which each column includes the same kind of information and where items in a row are connected to one another. It can be compared to a single spreadsheet or an empty database table. Small applications without complicated data are best suited for this schema style.
  - **Hierarchical Model** – The hierarchical model design has a structure that resembles a tree. The data's root node and any child nodes are found in the tree structure. The parent node and each child node have a one-to-many relationship. XML or JSON files can contain entities and their sub-entities, making them suitable for presenting these types of database schemas.
  - **Network Model** – Since the network model design represents a collection of nodes and vertices, it is comparable to hierarchical design. The many-to-many relationship is the primary way in which the network model differs from the hierarchical model. The hierarchical paradigm, in comparison, only permits a one-to-many link.

- **Relational Model** – In a relational database, where data is stored as table relations, relational models are utilized. To handle data and derive various values from it, relational operators are used.
- **Star Schema** - The star schema is an alternative method of organizing data using a schema. It functions on "Facts" and "Dimensions" and is most effective for storing and analyzing massive amounts of data.
- **Snowflake Schema** – A star schema has been modified to create the snowflake schema. The key data points and references to the star schema's dimension tables are contained in a main "Fact" table. However, dimension tables in Snowflake can have their very own dimension tables.

8. Database Approach

- The database approach is a way to create and use databases that emphasizes the usage of characteristics to make sure the data is reliable, consistent, and simple to retrieve. Data independence, data integrity, data exchange, and backup and recovery are some of these traits. Organizations can create and deploy efficient databases that match their unique needs by comprehending and exploiting these characteristics.

9. Advantages/Disadvantages of Database

ADVANTAGES	DISADVANTAGES
Database eliminates the redundancy of data by integrating them	Complex software
Data consistency is increased	It requires more memory
Additional information can be derived from same data	Multiuser DBMS can be more expensive
Database improves security	Performance can be poor sometimes
It is cost-efficient	Damage to database affects virtually all applications programs

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