**Chapter 15 - Review Questions**

**4. How and why did database management systems become the organizational data management standard? Discuss some advantages of the database approach over the file-system approach.**

* The DBMS serves as the intermediary between the user and the database. 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. Having a DBMS between the end user’s applications and the database offers some important advantages. First, the DBMS enables the data in the database to be shared among multiple applications or users. Second, the DBMS integrates the many different users’ views of the data into a single all-encompassing data repository.

Because data are the crucial raw material from which information is derived, you must have a good method to manage such data. The DBMS helps make data management more efficient and effective. In particular, a DBMS provides advantages such as:

* **Improved data sharing**. The DBMS helps create an environment in which end users have better access to more data and better-managed data. Such access makes it possible for end users to respond quickly to changes in their environment.
* **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. A DBMS provides a framework for better enforcement of data privacy and security policies.
* **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. It becomes much easier to see how actions in one segment of the company affect other segments.
* **Minimized data inconsistency**. **Data inconsistency** exists when different versions of the same data appear in different places. For example, data inconsistency exists when a company’s sales department stores a sales representative’s name as “Bill Brown” and the company’s personnel department stores that same person’s name as “William G. Brown” or when the company’s regional sales office shows the price of a product as $45.95 and its national sales office shows the same product’s price as $43.95. The probability of data inconsistency is greatly reduced in a properly designed database.
* **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. For example, end users, when dealing with large amounts of sales data, might want quick answers to questions (ad hoc queries) such as:
  + What was the dollar volume of sales by product during the past six months?
  + What is the sales bonus figure for each of our salespeople during the past three months?
  + How many of our customers have credit balances of $3,000 or more?
* **Improved decision making**. Better-managed data and improved data access make it possible to generate better quality information, on which better decisions are based.
* **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.

**7. Describe and contrast the information needs at the strategic, tactical, and operational levels in an organization. Use examples to explain your answer.**

* Data are used by different people in different departments in an organization for different reasons. Therefore, data management must address the concept of shared data. Whatever the type of organization, the database’s predominant role is to support managerial decision making at all levels in the organization while preserving data privacy and security.

An organization’s managerial structure might be divided into three levels: **top**, **middle**, and **operational**. Top-level management makes **strategic** decisions, middle management makes **tactical** decisions, and **operational** management makes daily operational decisions. Operational decisions are short term and affect only daily operations; for example, deciding to change the price of a product to clear it from inventory. Tactical decisions involve a longer time frame and affect larger-scale operations; for example, changing the price of a product in response to competitive pressures. Strategic decisions are those that affect the long-term well-being of the company or even its survival; for example, changing pricing strategy across product lines to capture market share.

The DBMS must provide tools that give each level of management a useful view of the data and that support the required level of decision making. The following activities are typical of each management level:

* At the top management level, the database must be able to:
  + Provide the information necessary for strategic decision making, strategic planning, policy formulation, and goals definition.
  + Provide access to external and internal data to identify growth opportunities and to chart the direction of such growth. (Direction refers to the nature of the operations: Will a company become a service organization, a manufacturing organization, or some combination of the two?)
  + Provide a framework for defining and enforcing organizational policies. (Remember that such polices are translated into business rules at lower levels in the organization.)
  + Improve the likelihood of a positive return on investment for the company by searching for new ways to reduce costs and/or by boosting productivity.
  + Provide feedback to monitor whether the company is achieving its goals.
* At the middle management level, the database must be able to:
  + Deliver the data necessary for tactical decisions and planning.
  + Monitor and control the allocation and use of company resources and evaluate the performance of the various departments.
  + Provide a framework for enforcing and ensuring the security and privacy of the data in the database. Security means protecting the data against accidental or intentional use by unauthorized users. Privacy deals with the rights of individuals and the organization to determine the “who, what, when, where, and how” of data usage.
* At the operational management level, the database must be able to:
  + Represent and support the company operations as closely as possible. The data model must be flexible enough to incorporate all required present and expected data.
  + Produce query results within specified performance levels. Keep in mind that the performance requirements increase for lower levels of management and operations. Thus, the database must support fast responses to a greater number of transactions at the operational management level.
  + Enhance the company’s short-term operational ability by providing timely information for customer support and for application development and computer operations.

**8. What special considerations must you take into account when contemplating the introduction of a DBMS into an organization?**

* + The special considerations that we must take into account when contemplating the introduction of a DBMS into an organization can be categorized into 3 considerations: Managerial, Technical and Cultural. For example, some questions for discussion can be:
    1. What about retraining requirements for the new system?
       1. Who needs to be retrained?
       2. What must be the type and extent of the retraining?
    2. Is it reasonable to expect some resistance to change?
       1. From the computer services department administrator(s)?
       2. From secretaries?
       3. From technical support personnel?
       4. From other department end users?
    3. How will the resistance in the preceding question be manifested?
    4. How will you deal with such resistance?

**9. Describe the DBA’s responsibilities.**

* + The database administrator (DBA) is the person responsible for the control and management of the shared database within an organization. The DBA controls the database administration function within the organization.

The DBA is responsible for managing the overall corporate data resource, both computerized and non-computerized. Therefore, the DA is given a higher degree of responsibility and authority than the DBA. Depending on organizational style, the DBA and DA roles may overlap and may even be combined in a single position or person.

The DBA position requires both managerial and technical skills. The DBA is responsible for Coordinating, monitoring, and allocating database administration resources: people and data and defining goals and formulating strategic plans for the database administrator function.

**15. Describe and characterize the skills desired for a DBA.**

* + The activities, characteristics and skills desired for a DBA are:
    1. Controls and supervises.
    2. Executes plans to reach goals.
    3. Enforces policies and procedures.
    4. Enforces programming standards.
    5. Is narrow in scope.
    6. Focuses on the short term (daily operations).
    7. Has a technical orientation.
    8. Is DBMS-specific.

Additionally, the DBA skills can be divided into two categories – managerial and technical.

**Managerial**:

* + Broad business understanding.
  + Coordination skills.
  + Analytical skills.
  + Conflict resolution skills.
  + Communications skills (oral and written).
  + Negotiation skills.

**Technical**:

* Broad data-processing background.
* Systems development life cycle knowledge.
* Structured methodologies:
  + Data flow diagrams
  + Structure charts
  + Programming languages
* Database life cycle knowledge.
* Database modeling and design skills
  + Conceptual
  + Logical
  + Physical
* Operational skills:
  + Database implementation
  + Data dictionary management, security, and so on.

**20. Discuss the importance and characteristics of database backup and recovery procedures. Then describe the actions that must be detailed in backup and recovery plans.**

* + When data are not readily available, companies face potentially ruinous losses. Therefore, data backup and recovery procedures are critical in all database installations. The DBA also must ensure that the data in the database can be fully recovered in case of physical data loss or loss of database integrity. Data loss can be partial or total. A partial loss is caused by a physical loss of part of the database or when part of the database has lost integrity. A total loss might mean that the database continues to exist but its integrity is entirely lost or that the entire database is physically lost. In any case, backup and recovery procedures are the cheapest database insurance you can buy. The management of database security, integrity, backup, and recovery is so critical that many DBA departments have created a position called the **database security officer** (**DSO**). The DSO’s sole job is to ensure database security and integrity. In large organizations, the DSO’s activities are often classified as disaster management.

**Disaster Management** includes all of the DBA activities designed to secure data availability following a physical disaster or a database integrity failure. Disaster management includes all planning, organizing, and testing of database contingency plans and recovery procedures. The backup and recovery measures must include at least:

* + **Periodic data and applications backups**. Some DBMSs include tools to ensure backup and recovery of the data in the database. The DBA should use those tools to render the backup and recovery tasks automatic. Products such as IBM’s DB2 allow the creation of different backup types: full, incremental, and concurrent. A **full backup**, also known as a **database dump**, produces a complete copy of the entire database. An **incremental backup** produces a backup of all data since the last backup date; a **concurrent backup** takes place while the user is working on the database.
  + **Proper backup identification**. Backups must be clearly identified through detailed descriptions and date information, thus enabling the DBA to ensure that the correct backups are used to recover the database.
  + **Convenient and safe backup storage**. There must be multiple backups of the same data, and each backup copy must be stored in a different location. The storage locations must include sites inside and outside the organization. (Keeping different backups in the same place defeats the purpose of having multiple backups in the first place.)
  + **Physical protection of both hardware and software**. Protection might include the use of closed installations with restricted access, as well as preparation of the computer sites to provide air conditioning, backup power, and fire protection. Physical protection also includes the provision of a backup computer and DBMS to be used in case of emergency.
  + **Personal access control to the software of a database installation**. Multilevel passwords and privileges and hardware and software challenge/response tokens can be used to properly identify authorized users of resources.
  + **Insurance coverage for the data in the database**. The DBA or security officer must secure an insurance policy to provide financial protection in the event of a database failure. The insurance might be expensive, but it is less expensive than the disaster created by massive data loss.