

## UNIT-V (CHAPTER-II)

# Database Administration

### (I) Data as a Corporate Asset:

- Data were seldom viewed as a company asset for two reasons:
  - There were simply too many data to be processed manually
  - Internal and external business operations moved at a much slower pace than they do today, so there was relatively little need for quick reactions triggered by fast-flowing information.
- The computer liberated both managers and data. Data are now better understood as a resource.
- An organization is subject to a data-information-decision cycle.

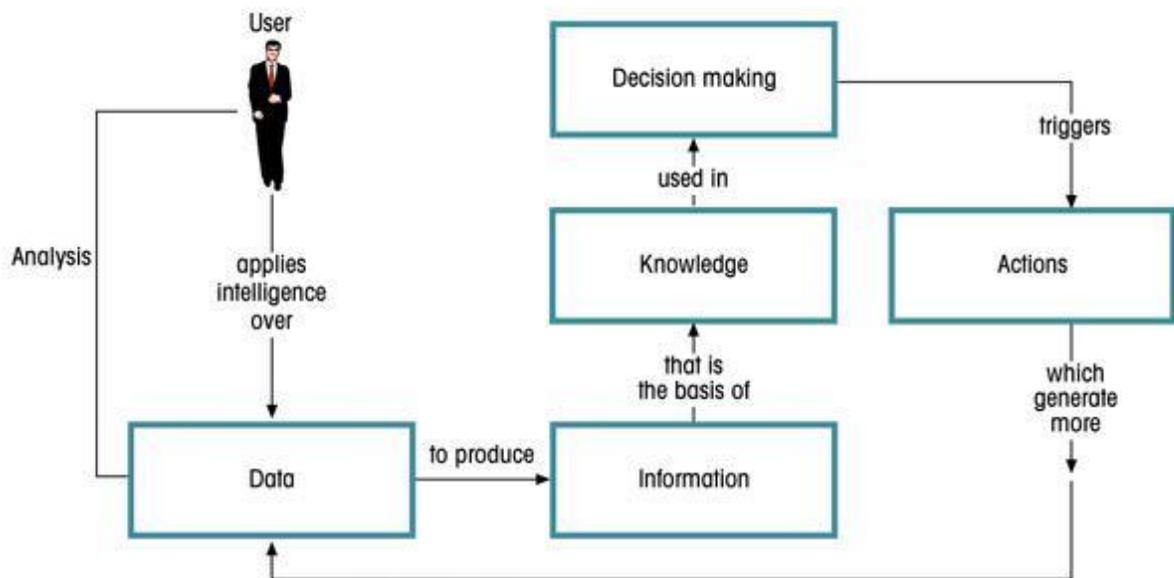


FIGURE 15.1 THE DATA-INFORMATION-DECISION CYCLE

### (II) The Need for and Role of Databases in an Organization:

Used properly, the DBMS facilitates:

- a. Interpretation and presentation of data in useful formats, by transforming raw data into information.
- b. Distribution of data and information to the right people at the right time.

- c. **Data preservation and data usage monitoring for adequate periods of time.**
- d. **Control over data duplication and use, both internally and externally.**

The database's predominant role is to support *managerial decision making at all levels in the organization*.

### **DB Support at Different Management Levels:**

#### **A Top Management Level**

- 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.
- Provide a framework for defining and enforcing organizational policies.
- 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.

#### **B Middle Management**

- Deliver the data necessary for tactical decisions and planning.
- Monitor and control the allocation and use of company resources
  1. How efficiently are resources allocated and used?
  2. What potential or current operational problems exist?
  3. Evaluate the performance of the different departments.
- Provide a framework for enforcing and ensuring the security and privacy of the data in the database.

#### **C Operational Management**

- Represent and support the company operations as closely as possible.
- Produce query results within specified performance levels.
- Enhance the company's short-term operational ability by providing
  4. Timely information for customer support

5. Support for application development and computer operations.

### (III) Introduction of a Database:Special Considerations:

- The introduction of a DBMS represents a big change and challenge and is likely to have a profound impact throughout the organization.
- The main issue of the DBMS should be the organization's needs rather than the DBMS's technical virtues.
- Three important aspects:
  1. Technological: DBMS hardware and software
  2. Managerial: Administrative functions
  3. Cultural: Corporate resistance to change

### (III) The Evolution of the Database Administration Function:

- The general coordinator of all DBAs is known as the systems administrator (SYSADM).
- Some large corporations make a distinction between a DBA and the data administrator (DA).
  - a. The DA, a.k.a., the information resource manager (IRM), usually reports directly to top management and is given a higher degree of responsibility and authority than the DBA.
  - b. The DA is responsible for controlling the overall corporate data resource, both computerized and non-computerized.

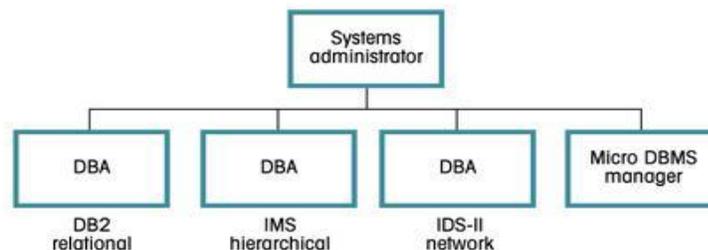


FIGURE 15.5 MULTIPLE DATABASE ADMINISTRATORS IN AN ORGANIZATION

### Electronic Data Processing (EDP) Department:

#### Data process (DP) department

- Its task was to pool all computer resources to support all departments at the operational level with a minimal duplication of data and effort.
- The DP department was in charge of coordinating and maintaining all operational applications.

#### Information Systems (IS) Department

- IS responsibilities were broadened to include:

1. A service function to provide end users with active data management service.
  2. A production function to provide end users with specific solutions for their information needs.
- The database administration function was created to handle increasingly complex data management tasks.
  - The person responsible for the control of the centralized and shared database was the database administrator (DBA).

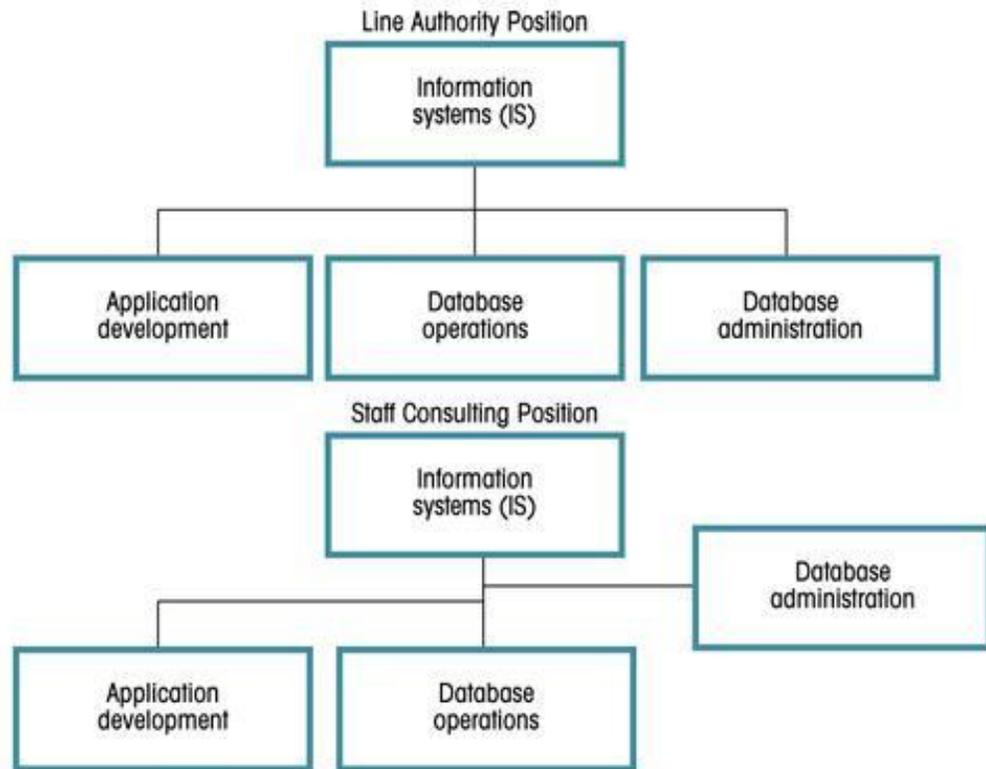


FIGURE 15.3 THE PLACEMENT OF THE DBA FUNCTION

### **Factors Affecting the Placement of DBA**

- Company management style
- Size and complexity of the company operations
- Geographic distribution of the company facilities

### **Changes in DBMS Technologies Affecting Organizational Styles**

- The development of distributed databases
- The growing use of Internet-ready and object-oriented databases and the growing number of data warehousing applications
- The increasing sophistication and power of microcomputer-based DBMS.

### DBA Activities:

- Database *planning*
- Database requirements-gathering and conceptual design
- Database *logical design* and *transaction design*
- Database *physical design* and *implementation*
- Database *testing* and *debugging*
- Database *operations* and *maintenance*, including installation, conversion, and migration
- Database *training* and *support*

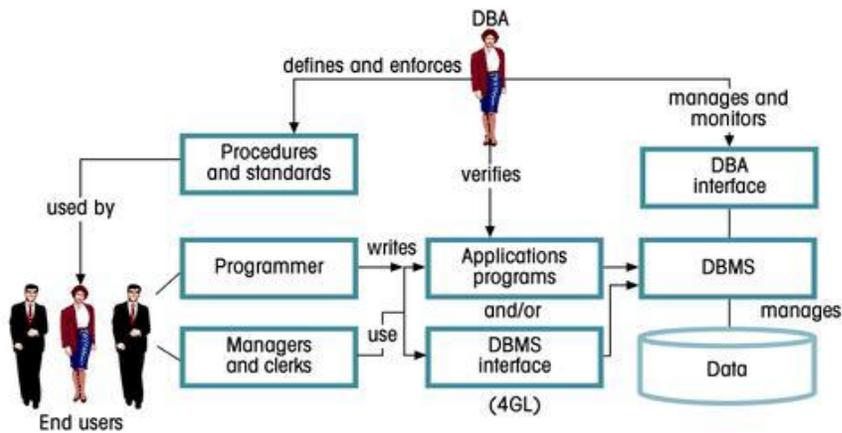


FIGURE 15.6 A SUMMARY OF DBA ACTIVITIES

### Desired DBA Skills:

TABLE 15.2 DESIRED DBA SKILLS

MANAGERIAL	TECHNICAL
Broad business understanding	Broad data-processing background
Coordination skills	Systems Development Life Cycle knowledge
Analytical skills	Structured methodologies: Data flow diagrams Structure charts Programming languages
Conflict resolution skills	Database Life Cycle knowledge
Communications skills (oral and written)	Database modeling and design skills Conceptual Logical Physical
Negotiation skills	Operational skills: database implementation, data dictionary management, security, etc.
Experience: 2–5 years in a large DP department	

### (IV) DBA ROLE:

#### A) The DBA's Managerial Role:

- Coordinating, monitoring, and allocating DB administration resources: people and data.
- Defining goals and formulating strategic plans for the DB administration function.

#### **End User Support:**

- User requirements-gathering
- Conflict and problem resolution
- Finding solutions to information needs
- Ensuring quality and integrity of application and data
- Building end user confidence
- Managing the training and support of DBMS users

#### **Policies, Procedures, and Standards:**

- Policies are general statements of direction or action that communicate and support the DBA goals.
- Standards are more detailed and specific than policies and describe the minimum requirement of a given DBA activity.
- Procedures are written instructions that describe a series of steps to be followed during the performance of a given activity.

#### **Data Security, Privacy, and Integrity:**

- Authorization management defines procedures for the following functions:
  - User access management
  - View definition
  - DBMS utilities access control
  - DBMS usage monitoring
- Security breaches can yield a database whose integrity is either preserved or corrupted:
  - Preserved: Action is required to avoid the repetition of similar security problems, but data recovery may not be necessary.
  - Corrupted: Action is required to avoid the repetition of similar security problems, and the database must be recovered to a consistent state.

### Data Backup and Recovery:

- The database security officer (DSO) is responsible for the assurance of the database security and integrity.
- Disaster management includes all planning, organizing, and testing of database contingency plans and recover procedures.
  - Periodic data and applications backups
  - Proper backup identification
  - Convenient and safe backup storage
  - Physical protection
  - Personal access control
  - Insurance coverage for the data in the database

### Data Distribution and Use:

#### B) The DBA's Technical Role :

- DBMS and utilities evaluation, selection, and installation
- Design and implementation of databases and applications
- Testing and evaluation of databases and applications
- Operation of the DBMS, utilities, and applications
- Training and supporting users
- Maintenance of the DBMS, utilities, and applications

#### C) Design and Implementation of Databases and Applications:

- Data modeling and design services at conceptual, logical, and physical levels
- Review of the design to ensure that transactions are:
  - Correct: The transactions mirror real-world events.
  - Efficient: The transactions do not overload the DBMS.
  - Compliant with integrity and standards.
- Database storage and access plans
- Database operational procedures

#### D) Testing and Evaluation of Databases and Applications:

- Technical aspects of both the applications and the database
- Evaluation of the written documentation
- Observance of standards for naming, documenting, and coding
- Data duplication conflicts with existing data
- The enforcement of all data validation rules

**E) Operation of the DBMS, Utilities, and Applications:**

- System Support
- Performance monitoring and tuning
- Backup and recovery
- Security auditing and monitoring

**F) Training and Supporting Users:**

- Training users and application programmers to use the DBMS and its tools
- Unscheduled, on-demand technical support for end user and programmers
- External sources (e.g., vendors) for support

**G) Maintenance of the DBMS, Utilities, and Applications**

- Management of the physical storage devices
- Upgrading the DBMS and utility software
- Migration and conversion services for incompatible data and different DBMS

**(V) Database Administration Tools:**

A) **The Data Dictionary:**

**Different types of data dictionaries:**

- An integrated data dictionary is included with the DBMS, while a stand-alone data dictionary comes from a third-party vendor.

- An active data dictionary is automatically updated by the DBMS, while a passive data dictionary requires a batch process to create and update the dictionary.

### The Data Dictionary:

The data dictionary typically stores descriptions of all:

- Data elements defined in all tables of all databases
- Tables defined in all databases
- Indexes defined for each database table
- Defined databases
- End users and administrators of the database
- Programs that access the database
- Access authorizations for all users of all databases
- Relationships among the data elements

Data Dictionary Usage Examples:

#### Example 1

List the names and creation dates of all tables created by the user JONESVI in the current database.

```
SELECT NAME, CTIME
FROM SYSTABLES
WHERE CREATOR = 'JONESVI';
```

#### Example 2

List the names of the columns for all tables created by JONESVI in the current database.

```
SELECT NAME
FROM SYSCOLUMNS
WHERE CREATOR = 'JONESVI';
```

#### Example 3

List the names of all tables for which the user JONESVI has DELETE authorization.

```
SELECT NAME
FROM SYSTABAUTH
WHERE GRANTEE = 'JONESVI';
    AND DELETEAUTH = 'Y';
```

#### Example 4

List the names all users who have some type of authority over the INVENTORY table.

```
SELECT DISTINCT GRANTEE
FROM SYSTABAUTH
WHERE TTNAME = 'INVENTORY';
```

B) CASE Tools:

**CASE -- Computer-Aided Software Engineering**

**It provides an automated framework for the Systems Development Life Cycle.**

- **Front-end CASE tools provide support for the planning, analysis, and design phases.**
- **Back-end CASE tools provide support for the coding and implementation phases.**

**It is based on the use of structured methodologies and powerful graphical interfaces.**

**Benefits of CASE tools:**

- **A reduction in development time and costs**
- **The automation of the SDLC**
- **Standardization of the systems development methodologies**
- **Easier maintenance of application systems developed with CASE tools.**
- **Improve communications among the DBA, applications designers, and the end users.**

**(VI) Developing a Data Administration Strategy:**

Critical Success Factors for IS Strategy

- Management commitment
- Thorough company situation analysis
- End user involvement
- Defined standards
- Training
- A small pilot project

**(VII) Database Administration Using Oracle:**

- Security Manager
- Schema Manager
- Storage Manager
- SQL Worksheet
- Instance Manager



FIGURE 15.9 THE ORACLE ADMINISTRATOR TOOLBAR

## The Default Login

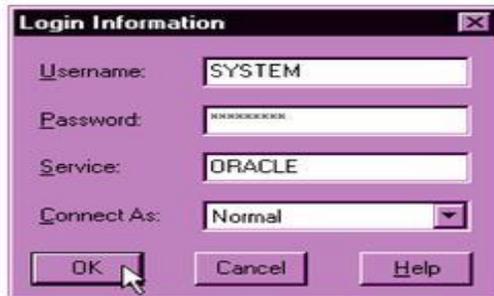


FIGURE 15.10 ORACLE LOGIN INFORMATION

## Ensuring an Automatic RDBMS Start

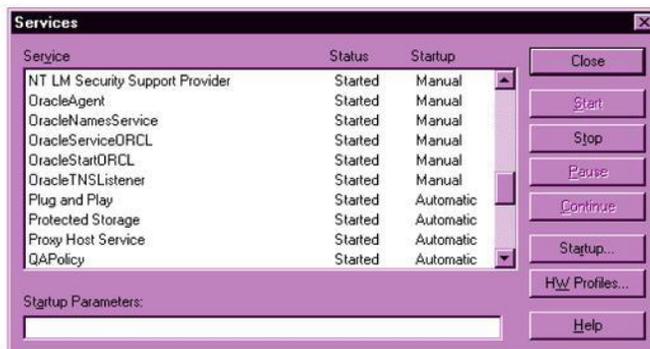


FIGURE 15.11 VERIFYING THAT THE ORACLE SERVICES ARE RUNNING

## Using the Storage Manager to Create Tablespaces and Datafiles

- A database is *logically* composed of one or more tablespaces. A tablespace is a logical storage space. Tablespaces are primarily used to logically group related data.
- The tablespace data are *physically* stored in one or more datafiles. A datafile physically stores the database's data.

When the DBA creates a database, Oracle automatically creates the tablespaces and datafiles shown in Figure :

- The SYSTEM tablespace is used to store the data dictionary data.
- The USER\_DATA tablespace is used to store the table and to index data created by the end users.
- The TEMPORARY\_DATA tablespace is used to store the temporary tables and indexes created during the execution of SQL statements.
- The ROLLBACK\_DATA tablespace is used to store database transaction recovery information.

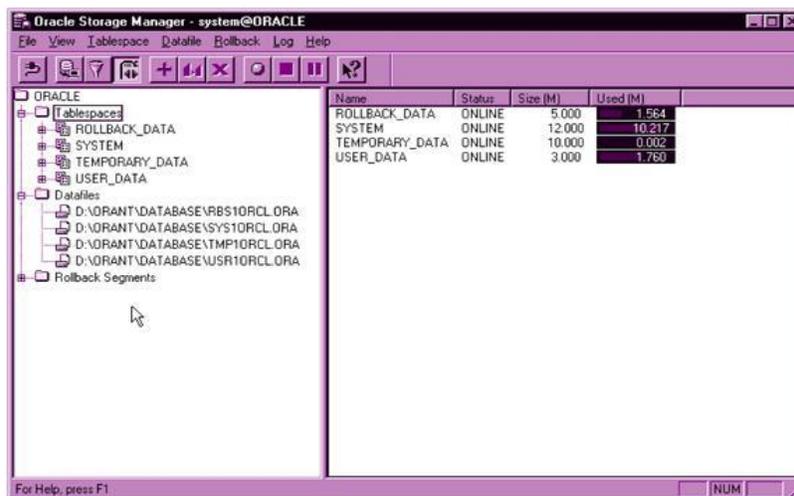


FIGURE 15.12 THE ORACLE STORAGE MANAGER