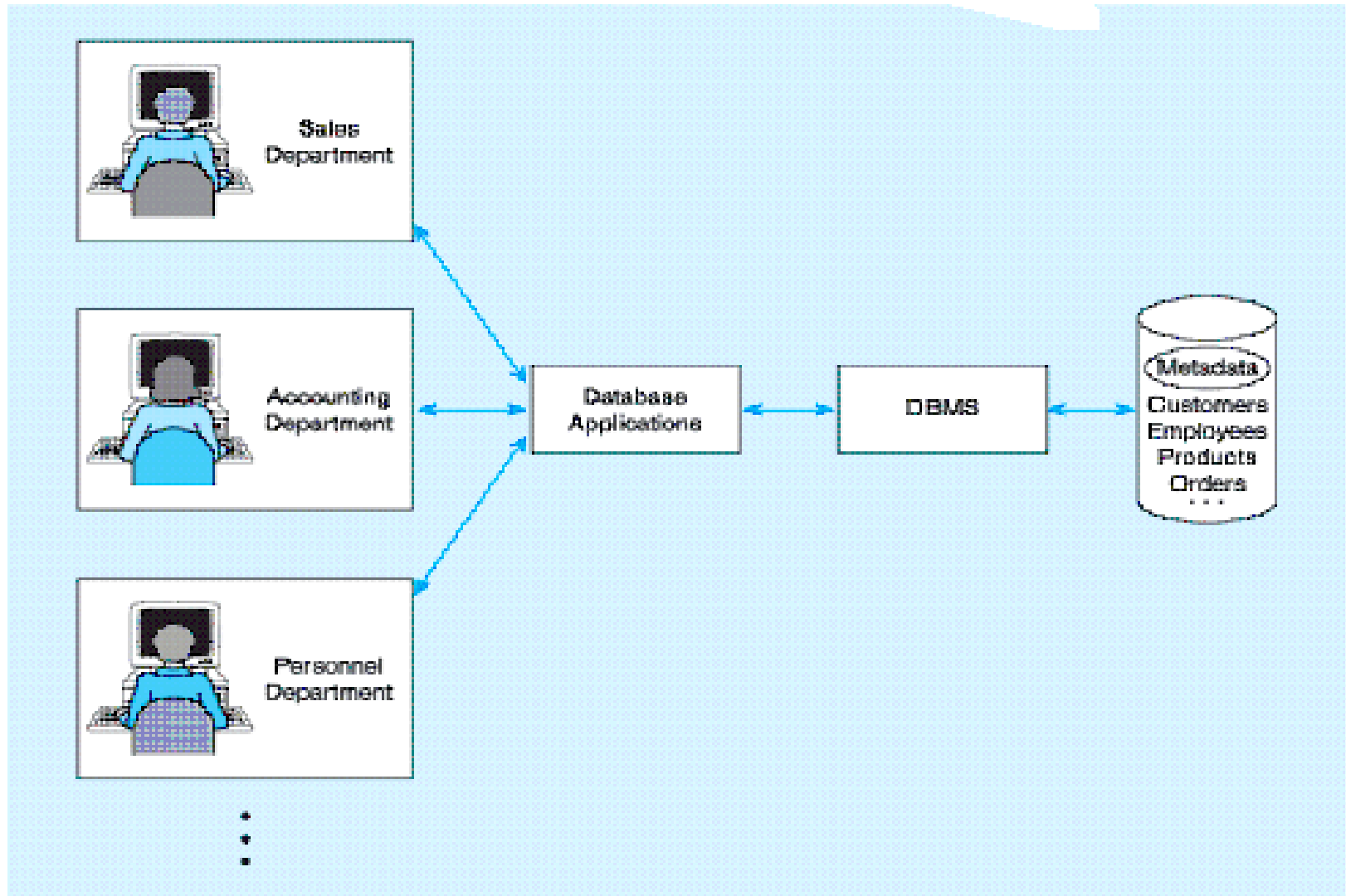


# Database Approach



- The Database approach was taken to overcome the limitations of the File-based systems.
- In this approach
  - A database is maintained.
  - A DBMS provides all the required services.
    - Note: A DBMS is a software system that enables users to define, create, maintain, and control access to the database. More on this in the next chapter.

# Example: Database Management System



# Benefits of Database systems

- **Data can be shared:** two or more users can access and use same data instead of storing data in redundant manner for each user
- **Improved data accessibility:** By using structured query languages, the users can easily access data without programming experience.
- **Redundancy can be reduced:** Isolated data is integrated in database to decrease the redundant data stored at different applications.
- **Quality data can be maintained:** the different integrity constraints in the database approach will maintain the quality leading to better decision making.
- **Inconsistency can be avoided:** controlled data redundancy will avoid inconsistency of the data in the database.

## Benefits ...



- **Integrity can be maintained:** Data at different applications will be integrated together with additional constraints to facilitate shared data resource
- **Security measures can be enforced:** the shared data can be secured by having different levels of clearance and other data security mechanisms.
- **Standards can be enforced:** the different ways of using and dealing with data by different units of the organization can be balanced and standardized by using database approach.

# Benefits ...



- **Less Labour**: Unlike the other data handling methods, data maintenance will not demand much resource
- **Centralized information control**: Since relevant data in the organization will be stored at one repository, it can be controlled and managed at the central level.
- **Data Independence** - Applications insulated from how data is structured and stored

# Limitations of database approach

- Introduction of **new professional** and **specialized personnel**
- **High cost** to be incurred to develop and maintain the system
- **Complex backup** and recovery services from the users perspective
- High impact on the system **when failure** occurs to the central system

# Roles of people in a Database Environment

- Data administrator

- Responsible for

- Management of data resources
- Database planning
- Development of standards
- Policies and procedures
- Consulting users

- Database administrator (more technical)

- Responsible for

- The physical design and implementation of databases
- Security and integrity control
- Maintenance
- Satisfactory performance

# Roles of people ...



- Database Designers

- Logical Designers

- Concerned with identifying the data, entities and attributes, relationships and constraints
    - Need a complete knowledge of the organization's data and business rules

- Physical Designers

- Decide how the logical database design is to be physically realized
    - Map the logical database design into a set of tables
    - Select specific storage structures and access methods
    - Design security measures



# Roles of people ...



- Application Developers

- Application programs provide the required functionality for the end user.
- Work based on the requirement specified by the system analyst.
- Each program contains statements that request the DBMS to perform some operation on the database – retrieving, inserting, updating and deleting data.

# Roles of people ...



## ● End Users

- End users require access to the database for querying, updating, and generating reports; the database primarily exists for their use.
- They are differentiated by the way they expect to interact with the system.
  - **Naive Users**
    - Unaware of the DBMS and the DB
    - Depend on the simplicity of the GUI
    - (E.g.. Bank tellers, clerical staff)
  - **Sophisticated Users**
    - Familiar with the structure of the database and the facilities of the DBMS
    - May use high-level query languages (SQL) to perform the required operation
    - May even write application program for their own use

# Database Architecture



- The **American National Standards Institute/ Standards Planning and Requirements Committee** (ANSI-SPARC) introduced the three-level architecture of the database based on their degree of abstraction.

# Levels of Abstraction - (Three level ANSI\_SPARC architecture )

- We have **three distinct levels** of data abstraction at which data items can be described.
- The levels form a three level architecture comprising an
  - **an external,**
  - **a conceptual** and
  - **an internal level.**
- The objective of the three-level architecture is **to separate each users' view** of the database from the way it is physically represented.



- **External level :**

The **users' view** of the database. This level describes part of the database that is relevant to each user.

- Each user has a view of the real world represented in a form that is **familiar for that user**. For example, one user may view dates in the form (day, month, year), while another may view dates as (year, month, day), some views may include derived or calculated data. That is, data not actually stored in the database,
- Entities, attributes or relationships that are not of interest to the users may still be represented in the database, but the **users will be unaware of them**.

## Conceptual level :

- the **community view** of the database. This level describes what data is stored in the database and the relationships among the data.
- Conceptual level is the middle level. It is a **complete view** of the data requirements of the organization.
- Any data available to a user must be contained in, or derivable from conceptual level

## Internal level :

- the **physical representation** of the database on the computer. This level describes how the data is stored in the database.
  - The internal level is concerned with such things as:
    - Storage space allocation for data
    - Record description for storage
    - Record placement
- The way the DBMS and OS perceive the data is the internal level.

## External level

Sno.	fname	Iname	age	Sal.
------	-------	-------	-----	------

Staff_no.	Iname	Br.no.
-----------	-------	--------

## Conceptual level

Staff_no.	fname	Iname	DOB	Sal.	Br. No.
-----------	-------	-------	-----	------	---------

## Internal level

```
Struct STAFF{  
  Int staff_no;  
  Char fname[15];  
  Char Iname[15];  
  Struct date date_of_birth;  
  Flooat sal;  
  Struct staff *next  
};
```

Difference between the three levels