Basics of DBMS

Syllabus

Introduction: Data, data processing requirement, desirable characteristics of an ideal data processing system, traditional file based system, its drawback, concept of data dependency, Definition of database, database management system, 3-schema architecture, database terminology, benefits of DBMS, Database development process - conceptual data modeling, logical database design, physical database design, database implementation, database maintenance.

Database Analysis: Conceptual data modeling using E-R data model -entities, attributes, relationships, generalization, specialization, specifying constraints. 5 – 6 practical problems based on E-R data model.

Relational Database: Relational data model: Introduction to relational database theory: definition of relation, relational model integrity rules, relational algebra and relational calculus.

Relational Database Design: Normalization- 1NF, 2NF, 3NF, BCNF, 4NF and 5NF. Concept of De-normalization and practical problems based on these forms.

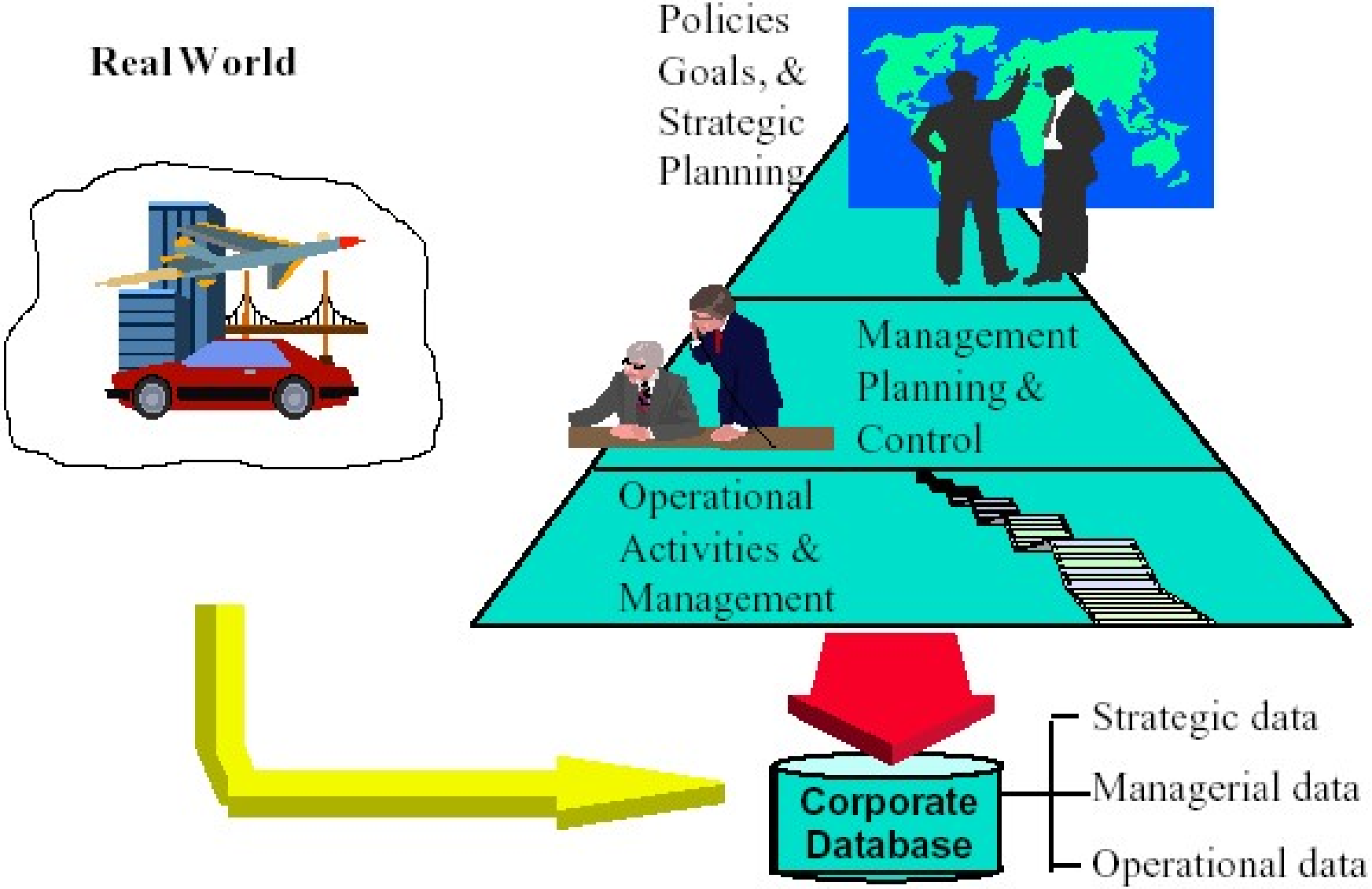
Syllabus

Indexing of Data: Impact of indices on query performance, basic structure of an index, creating indexes with SQL, Types of Indexing and its data structures.

Database Implementation: Introduction to SQL, DDL aspect of SQL, DML aspect of SQL – update, insert, delete & various form of SELECT-simple, using special operators, aggregate functions, group by clause, sub query, joins, co-related sub query, union clause, exist operator. PL/SQL - cursor, stored function, stored procedure, triggers, error handling, and package

A database is a computer based record keeping system whose over all purpose is to record and maintain information.

The Role of DBMS



(DBMS) Database Management System

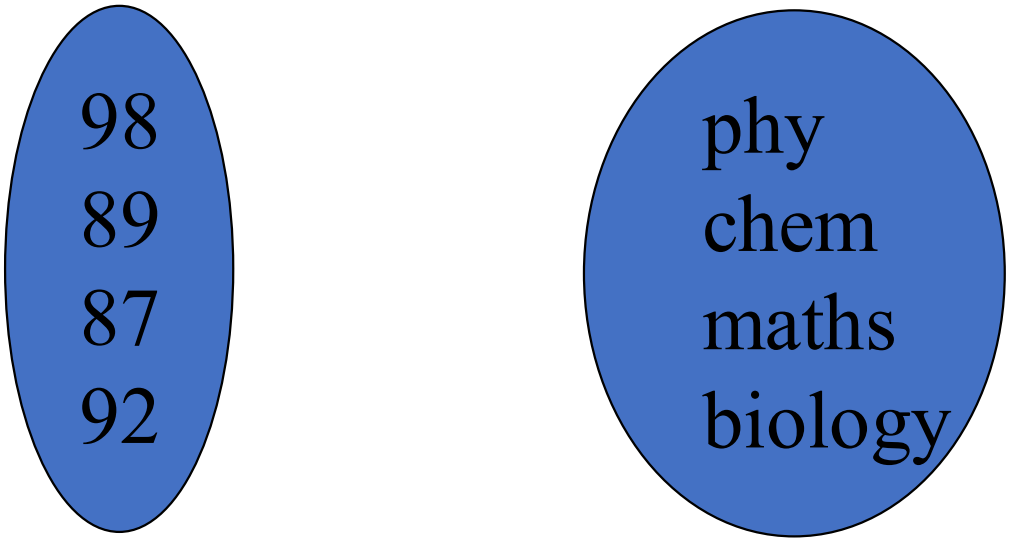
- Term Database requires understanding of DATA and INFORMATION

What is Data ?

Data is stored facts.

Data may be numerical data which may be integers or floating point numbers, and non-numerical data such as characters, date and etc.,

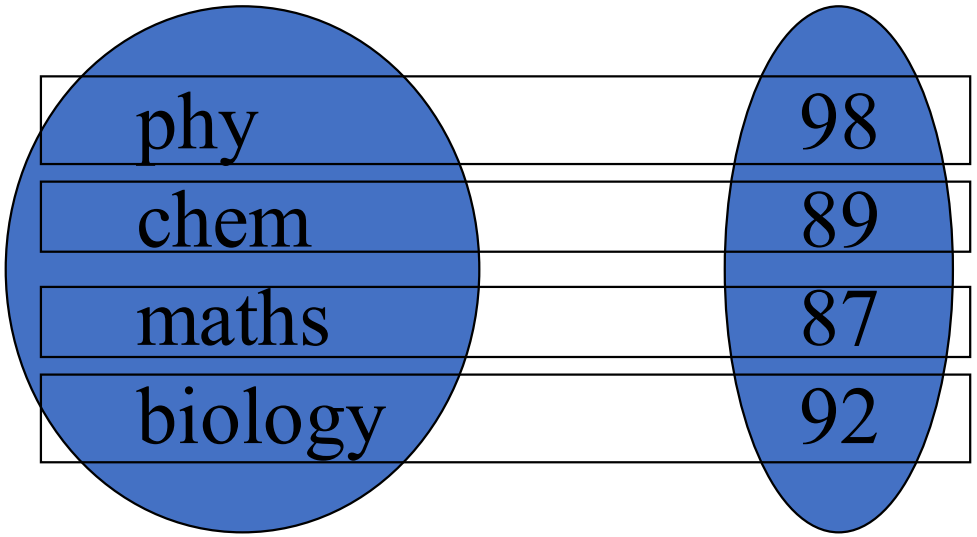
Eg :



The above numbers may be anything: It may be distance in kms or amount in rupees or no of days or marks in each subject etc.,

What is information ?

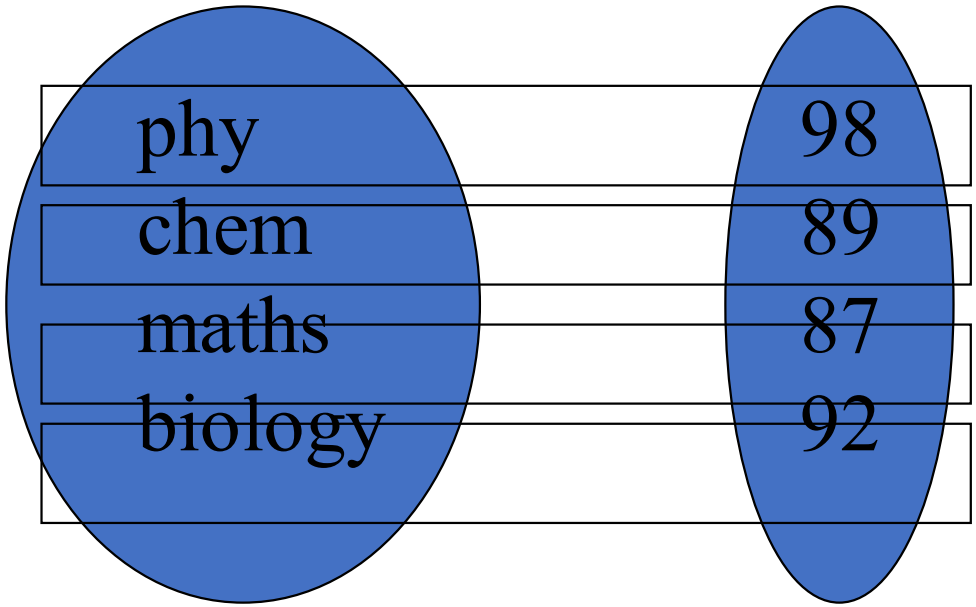
Information is RELATED DATA



Difference between Data and Information?

Data	Information
Data is raw fact and figures.	Information is a processes form of data.
For example: 23 is data.	For example: When 23 is stored in row column form as shown below in become information: Age 23
Data is not significant to a business and of itself.	Information is significant to a business and of itself; for example 23 is insignificant for business but age 23 is significant for a business like music.
Data are atomic level pieces of information.	Information is a collection of data, for example age and 23 collected together to form information.
For example in the healthcare industry, much activity surrounds data collection. Nurses collect data every day and sometimes hourly. Examples of data include vital signs, weight, and relevant assessment parameters.	Information, however, provides answers to questions that guide clinicians to change their practices. For example, the trending of vital signs over time provides a pattern that may lead to certain clinical decisions.
Data does not help in decision making.	As explained above information helps in decision-making.

DATABASE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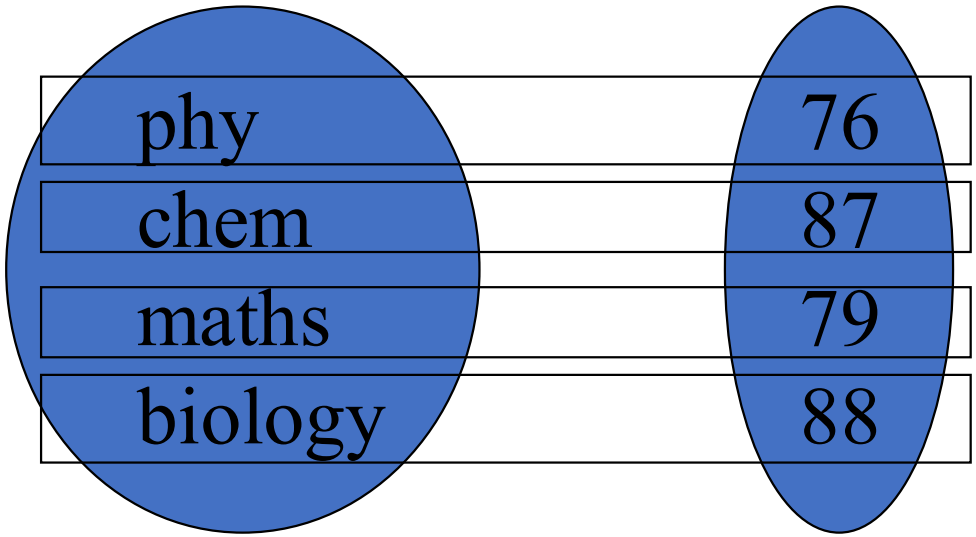
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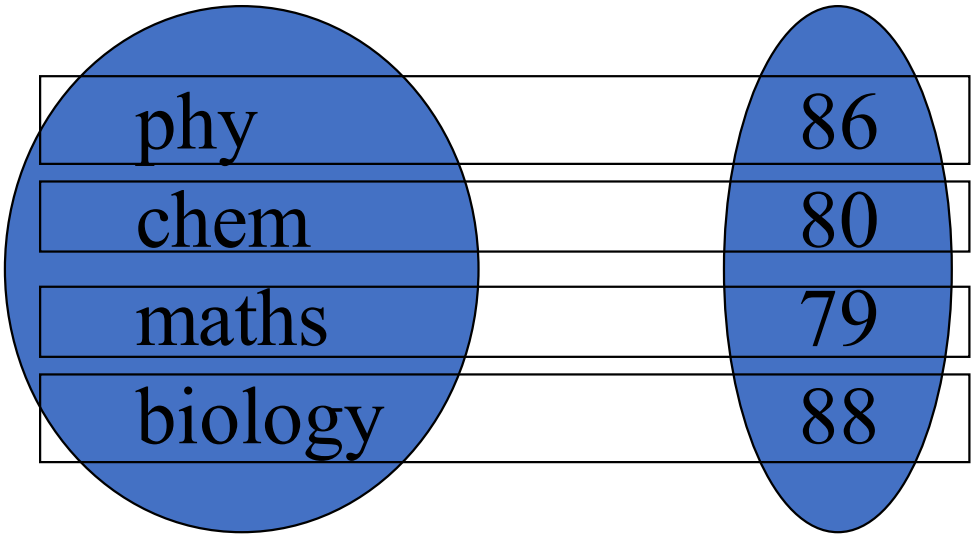
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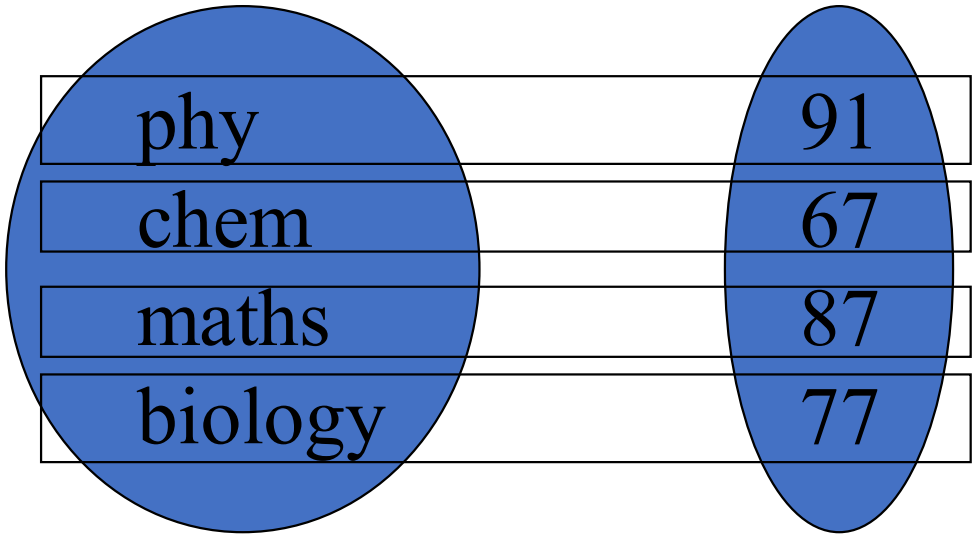
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What is DBMS ?

(DataBase Management System)

- A collection of programs that enables you to store, modify, and extract information from a database.
- The general purpose of a DBMS is to provide for the definition, storage, and management of data that can be shared by many users.
- E.g. ORACLE's database management system is patterned on the relational model described by Dr. E. F. Codd.

So……

- The related information when placed is an organized form makes a database.
- Database is a collection of information organized in such a way that a computer program can quickly select desired pieces of data.
- The organization of data/information is necessary because unorganized information has no meaning.

Operations on Databases

- To **add new information**
- To **view or retrieve** the stored information
- To **modify or edit** the existing information
- To **remove or delete** the unwanted information
- **Arranging the information** in a desired order
- etc.

Manual database and its problems

- Wastage of skills and intelligence of human beings on repetitive calculations.

- Error prone.

Database and Computers

- Large storage capacity
- It has high speed
- Computer is more accurate.

There are two approaches for storing data in computers such as File based approach and Database approach.

Evolution of DBMS

Closing the gap

80's -- today

Object-Oriented DB systems

80's

Relational DB Systems

60's & 70's

Hierarchical & Network Systems

50's

File Systems

File Based Approach

- File-based systems were an early attempt to computerize the manual filing system that we are all familiar with.
- File systems may use a storage device such as a hard disk or CD-ROM and involve maintaining the physical location of the files.
- Programmers used programming languages such as C, C++ etc. to write applications that directly accessed flat files to perform data management services and provide information for users.

File Systems (1950's)

- Basic constructs:
  - Sequential records
  - A record contains sequential fields
- Relies on indexes for random access

  ISAM (Indexed Sequential Access Method)

  VSAM (Virtual Storage Access Method)
- Basic operations
  - Open, close, or reset a file,
  - Read, write, or delete a record.

Limitations of the File-Based Approach

- Separated and Isolated Data
- Duplication of data
- Data Dependence
- Difficulty in representing data from the user's view
- Data Inflexibility
- Incompatible file formats

- Uncontrolled data redundancy, data inconsistency
- Poor data sharing
- Difficult to keep up with changes
  - Record format vs. user requirements
  - Programs vs. record format
- Low productivity
- High maintenance cost

Database Approach

- Database is a collection of information organized in such a way that a computer program can quickly select desired pieces of data.
- A DBMS is the software system that allows users to define, create and maintain a database and provides controlled access to the data.
- A database management system (DBMS) is basically a collection of programs that enables users to store, modify, and extract information from a database as per the requirements.

Examples of Database Applications

The following are main examples of database applications:

- **Computerized library systems**
- **Automated teller machines**
- **Flight reservation systems**
- **Computerized inventory systems**
- **Commercially available Database management systems in the market are dbase, Foxpro and Oracle etc.**

Example
University Database in File Based System

General Office	Library	Hostel	Account Office
Rollno	Rollno	Rollno	Rollno
Name	Name	Name	Name
Class	Class	Class	Class
Father_Name	Address	Father_Name	Address
Date_of_birth	Date_of_birth	Date_of_birth	Phone_No
Address	Phone_No	Address	Fee
Phone_No	No_of_books_issued	Phone_No	Installments
Previous_Record	Fine	Mess_Bill	Discount
Attendance	etc.	RoomNo	Balance
Marks		etc.	Total
Etc.			etc.

Advantages of DBMS

- **Controlling Redundancy**

- **Integrity can be enforced**

Integrity of data means that data in database is always accurate, such that incorrect information cannot be stored in database.

- **Inconsistency can be avoided**

When the same data is duplicated and changes are made at one site, which is not propagated to the other site, it gives rise to inconsistency and the two entries regarding the same data will not agree.

Advantages of DBMS

- Data can be shared
- Providing Backup and Recovery
- Standards can be enforced
- Restricting unauthorized access
- Solving enterprise requirement than individual requirement

Components of the DBMS Environment

- Hardware
- Software
- Data
- Users
- Procedures

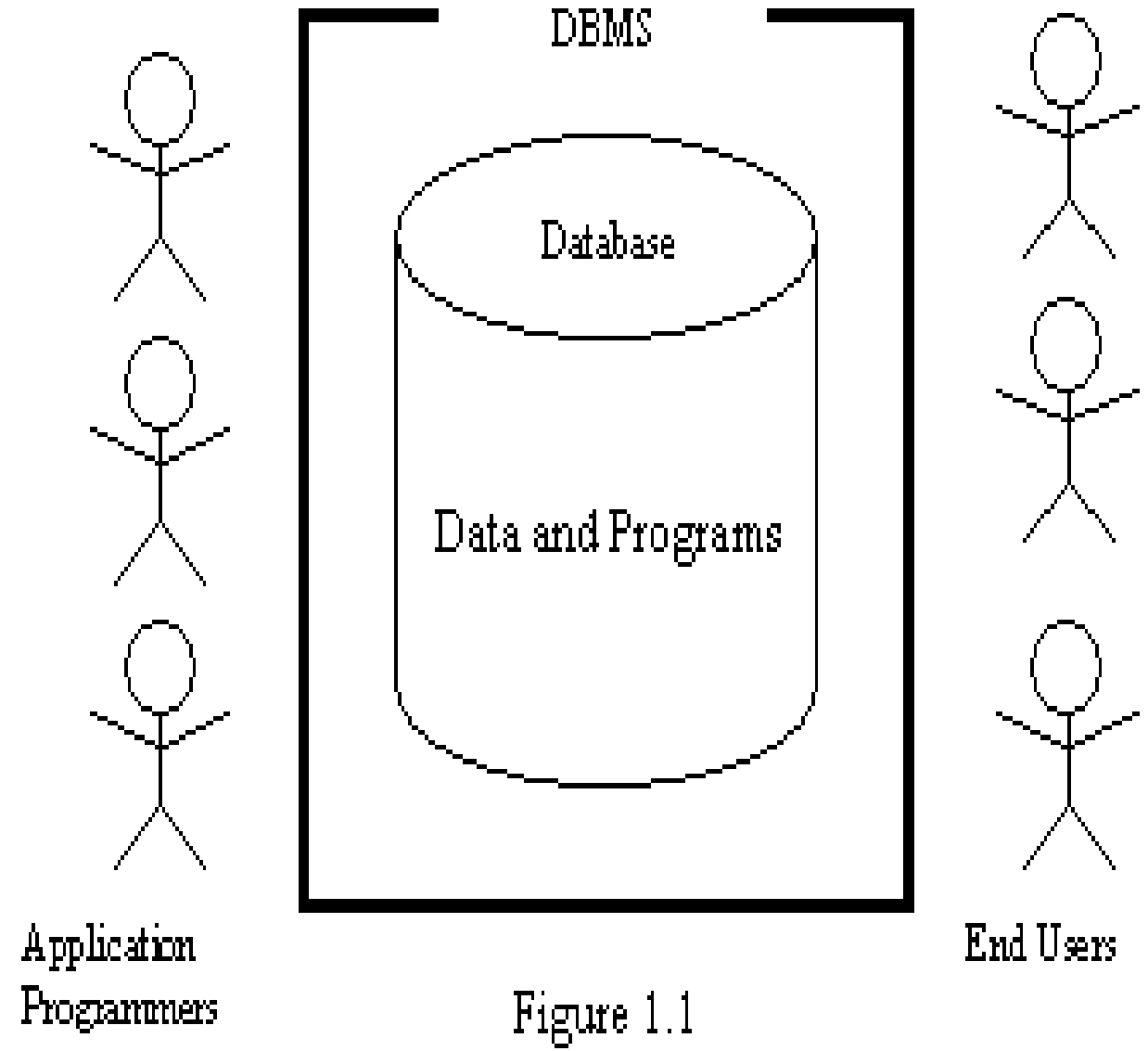

Figure 1.1

Disadvantages of DBMS

- **Complexity**
- **Size**
- **Performance**
- **Higher impact of a failure**
- **Cost of DBMS**
- **Additional Hardware costs**
- **Cost of Conversion**