1. Data isolation ⟹ multiple file formats

2. Difficulty in accessing Data ⟹
   need to write new programs to carry out
   Tasks

3. Atomicity of updates ⟹
   Failures may leave Database in inconsistent
   state with partial updates carried out

4. Concurrent access by multiple users ⟹
   - Concurrent access needed for performance
   - uncontrolled concurrent access can lead to
     inconsistencies

1. Schema definition

2. Storage structure and access-method
   modification

3. Schema and physical-organization modification

4. Periodically backing up the DB

5. Ensuring that enough disk space is
   available for normal operations,
   and upgrading disk space if required

Database systems are made up of complex data-
structures, to ease the user interaction with DB
the developers hide the level detail from user,
this is called Data Abstraction.

levels of abstraction:
   - Physical level → how records are stored
   - logical level → describe data stored in DB
                     and the relationships among them
   - view level → application program hide
                  details of data type

there are 2 types

1. procedural DML ⟹ require a user to specify
   what data are needed and how to get them

2. Declarative DML ⟹ require a user to specify
   what data are needed without how to get
   them.

a collection of operations that performs a
single logical function in a DB application

atomic ⟹

consistency ⟹

Isolation ⟹

Durable ⟹

⟹ ACID

Data redundancy and inconsistency ⟹
   data is stored in multiple file formats
   resulting induplication of information in
   different files

a program module that provides the interface
between the low-level data stored in the DB
and the application program and queries
submitted to the system.

it is responsible for ⟹
1. Interact with the OS file manager
2. Efficient storing, retrieving and updating of
   Data

SM components ⟹
1. Authorization and integrity manager
2. Transaction manager
3. File manager
4. Buffer manager

Data Architecture   DB 310 22