DATABASE SYSTEMS

INTRODUCTION TO FBS & DBS

By Sana Faiz
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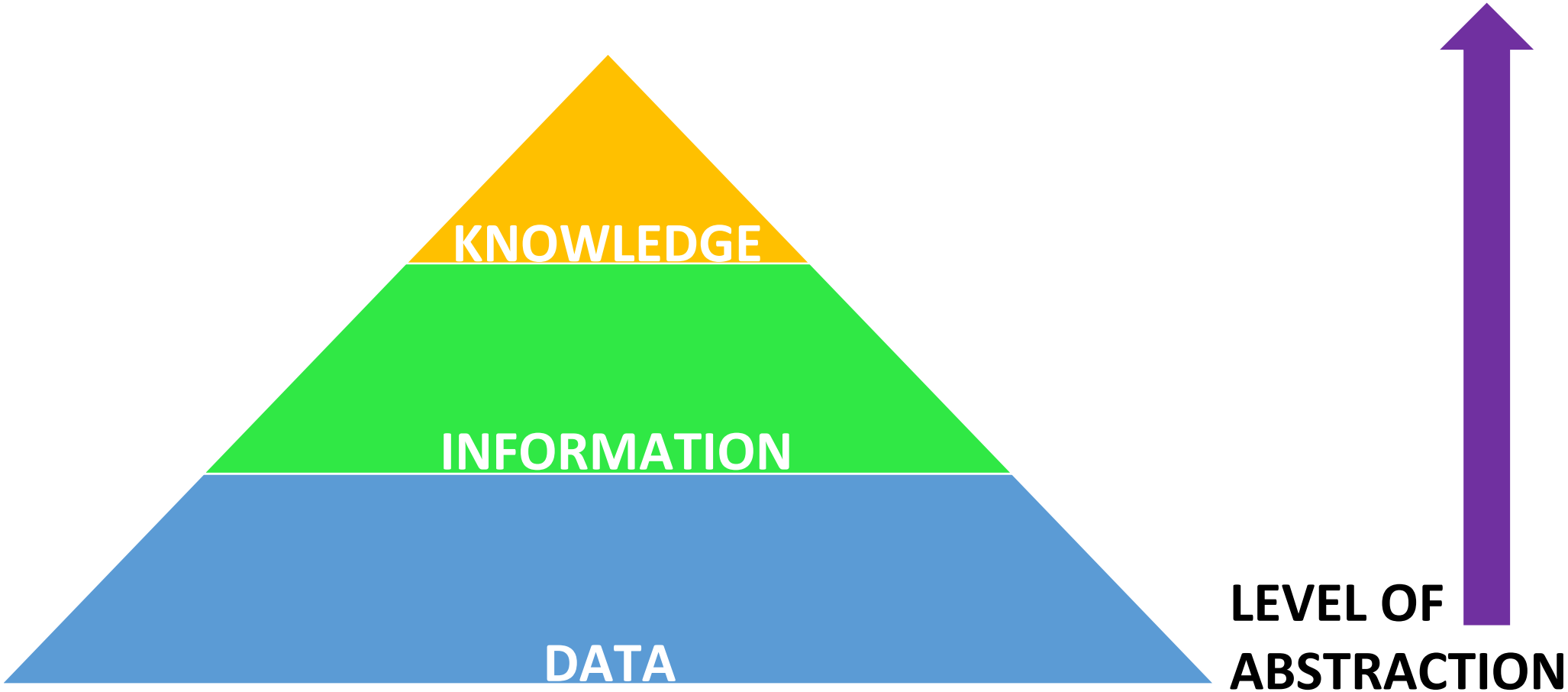
RECOMMENDED BOOKS

1. **Database Systems: A Practical Approach to Design, Implementation, and Management, Book by Carolyn E. Begg and Thomas M. Connolly Latest Edition.**

2. **Relational Database Management System: A Project-based Tutorial by Gerard Blokdyk, Latest Edition.**
3. **Oracle 11g with PL/SQL Approach by Cadcim Technologies , Sham Tickoo & Sunil Raina Latest Edition**

DATA , INFORMATION & KNOWLEDGE



PARADIGM

Data is the foundation of information, which is the bedrock of knowledge.

Data:

- Raw facts to be interpreted & correlated in order to provide information.

Information:

- Information is processed data that is in a form which is useful for making decisions.
- Information is generally reconstructed or devised from data.
- Good decisions require good information derived from raw facts.

ID	Name	Major	Credits
S1001	Tom	History	90
S1002	Ann	Art	36
S1005	Peter	Art	63

How many students are studying Art ?

Number of credit hours of students that are studying Art ?

INFORMATION DIMENSIONS

- Information has three dimensions:

1. Syntactic
2. Semantic
3. Pragmatic

Dimensions of Information

In the information theory three dimensions of information are distinguished: the syntactic, the semantic and the pragmatic. Let us take the example of a traffic light. In the syntactic dimension we differentiate the three colours red, yellow and green. But the traffic light makes more sense in the semantic dimension. In this dimension the colours are linked to meanings. Red means stop, green means go. However, only in the pragmatic dimension does the traffic light become useable for the traffic. Pragmatically, red means that the driver of a car must stop.

Try to read a letter in a foreign language (unknown), you will be able to recognize the structure and the syntactic aspects of it like the paragraphs, sentences, words, etc. but won't be able to make out the meaning of the writing.

INFORMATION VERSUS KNOWLEDGE

INFORMATION	KNOWLEDGE
Processed Data.	Actionable Information
Provides facts.	Allows predictions, associations and predictive decisions.
Information Management Systems.	Knowledge Management Systems.
DATA into INFORMATION	INFORMATION into KNOWLEDGE

DEPARTMENTAL STORE

Market Basket Analysis

? Where should detergents be placed in the Store to maximize their sales?

? Are window cleaning products purchased when detergents and orange juice are bought together?

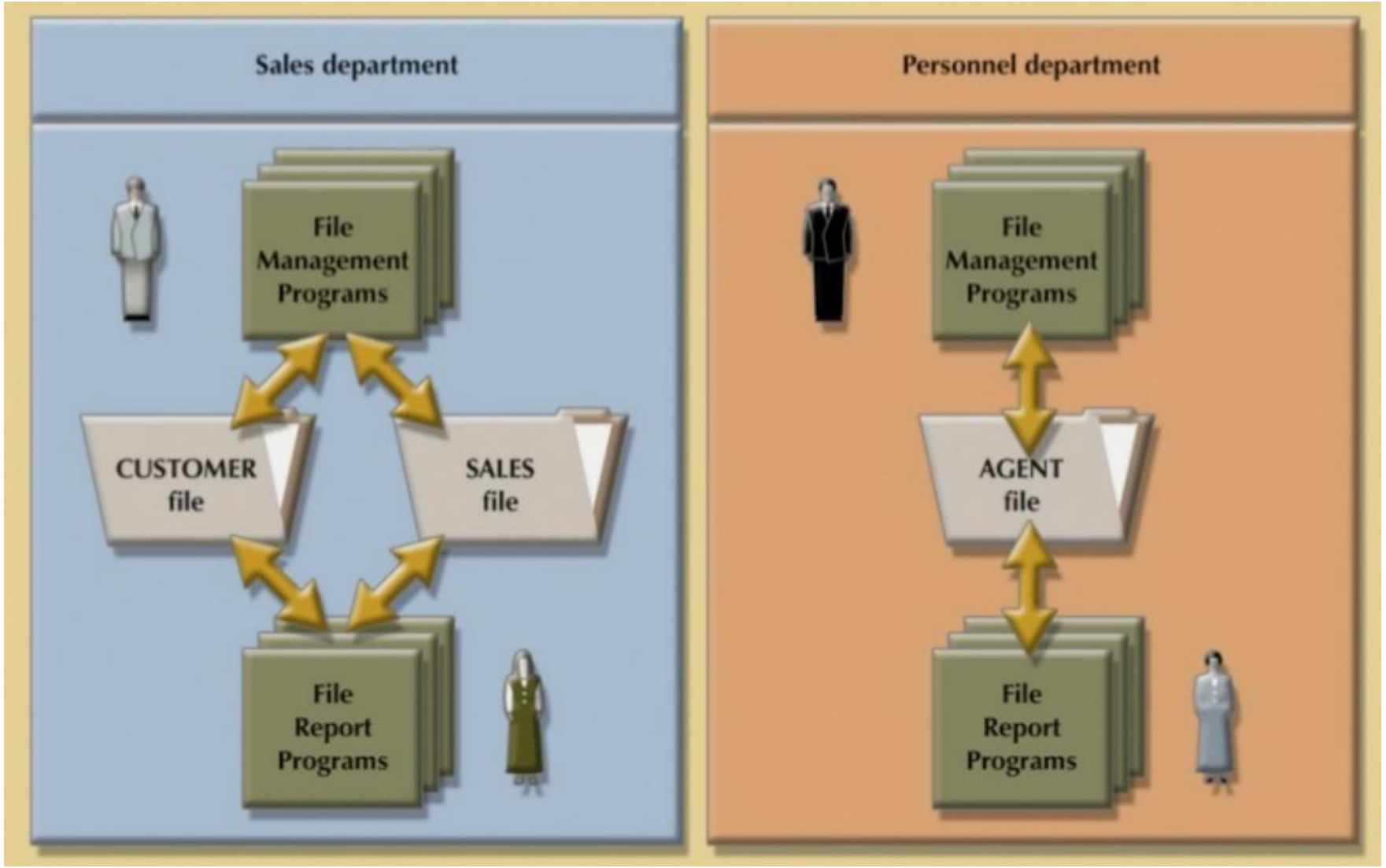
? Is soda typically purchased with bananas? Does the brand of soda make a difference?

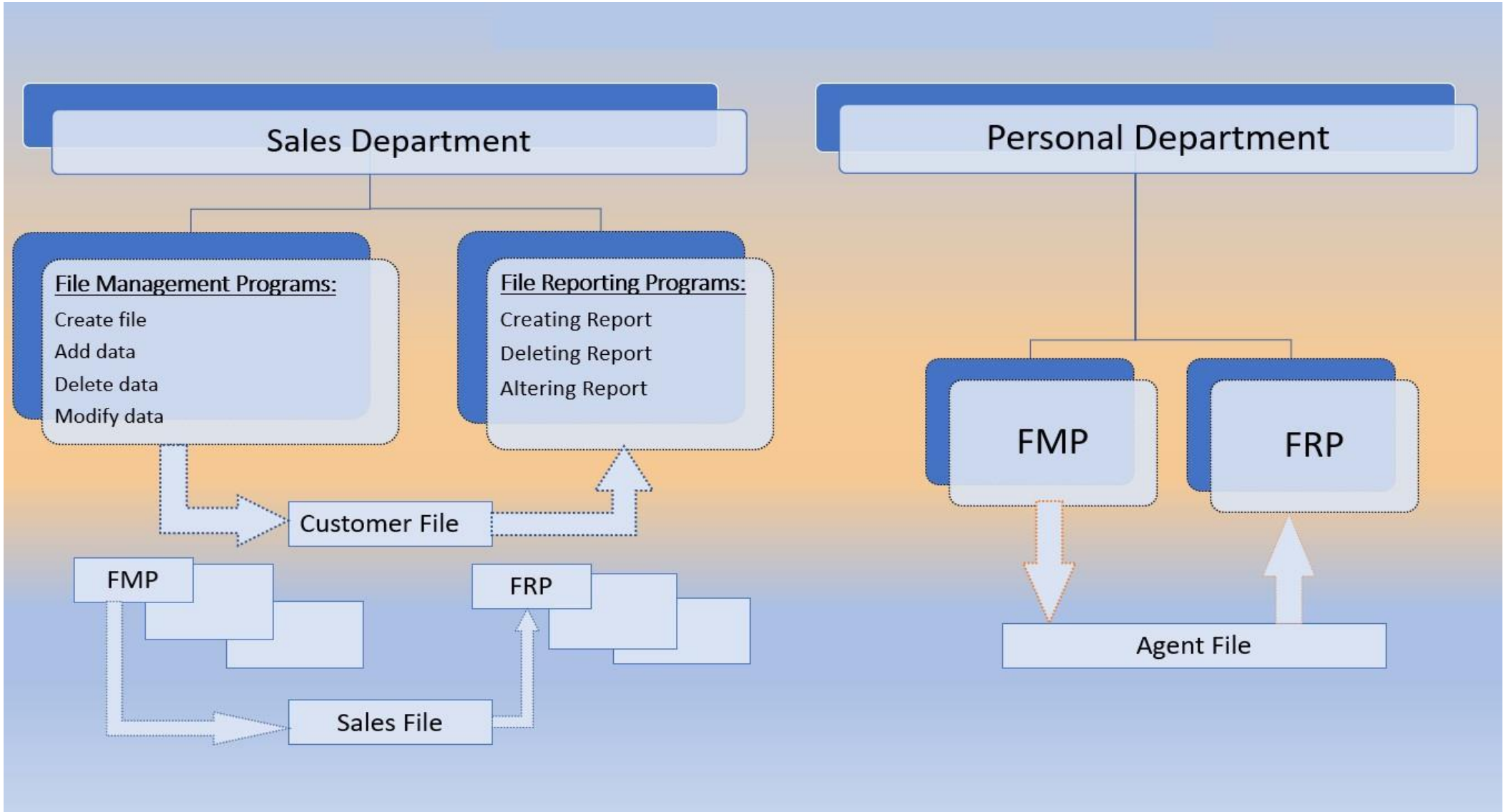
? How are the demographics of the neighborhood affecting what customers are buying?

FILE BASED SYSTEMS (FBS / CARD BOX)

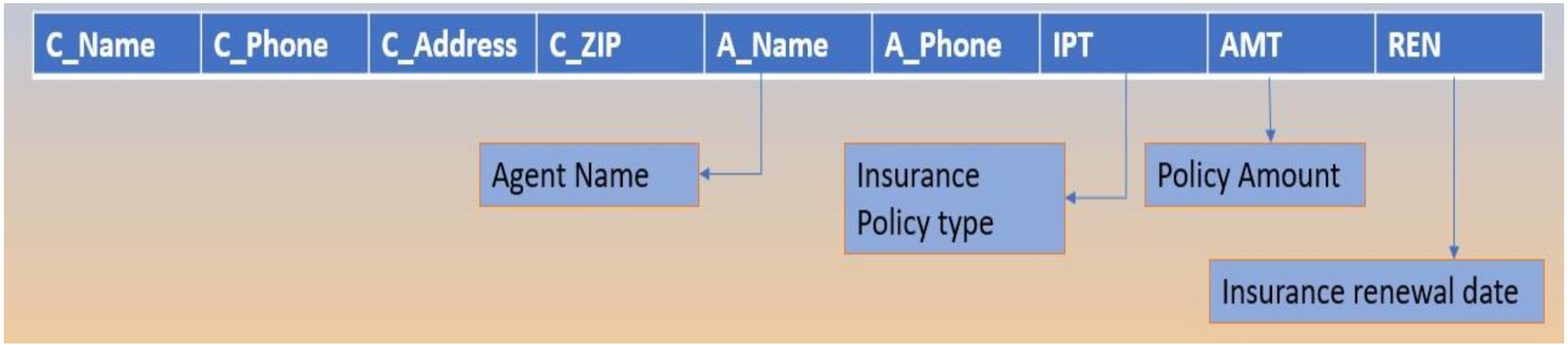
- FBS is a collection of application programs that perform services for users wishing to access information.
- In FBS, the data & the application programs were stored in separate files.
- Each application had its own data files that were created exclusively for the application.
- Same data was held separately by departments but not shared.

A SIMPLE FILE BASED SYSTEM




Sales Department
File Management Programs:
Create file
Add data
Delete data
Modify data
File Reporting Programs:
Creating Report
Deleting Report
Altering Report
Customer File
FMP
FRP
Sales File
Personal Department
FMP
FRP
Agent File

Customer File Contents



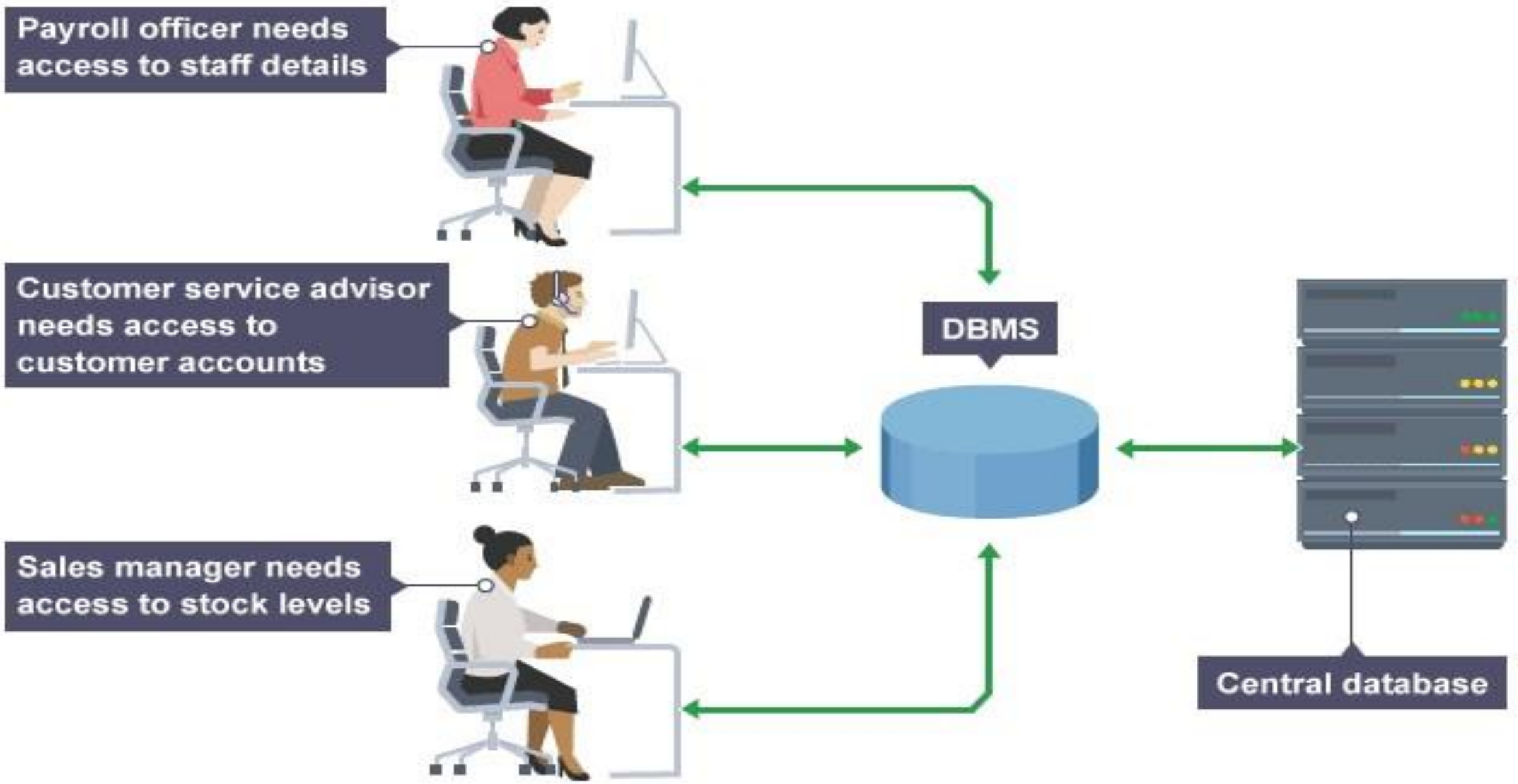
Agent File Contents

A-Name	A-Phone	A-Address	ZIP	Hired

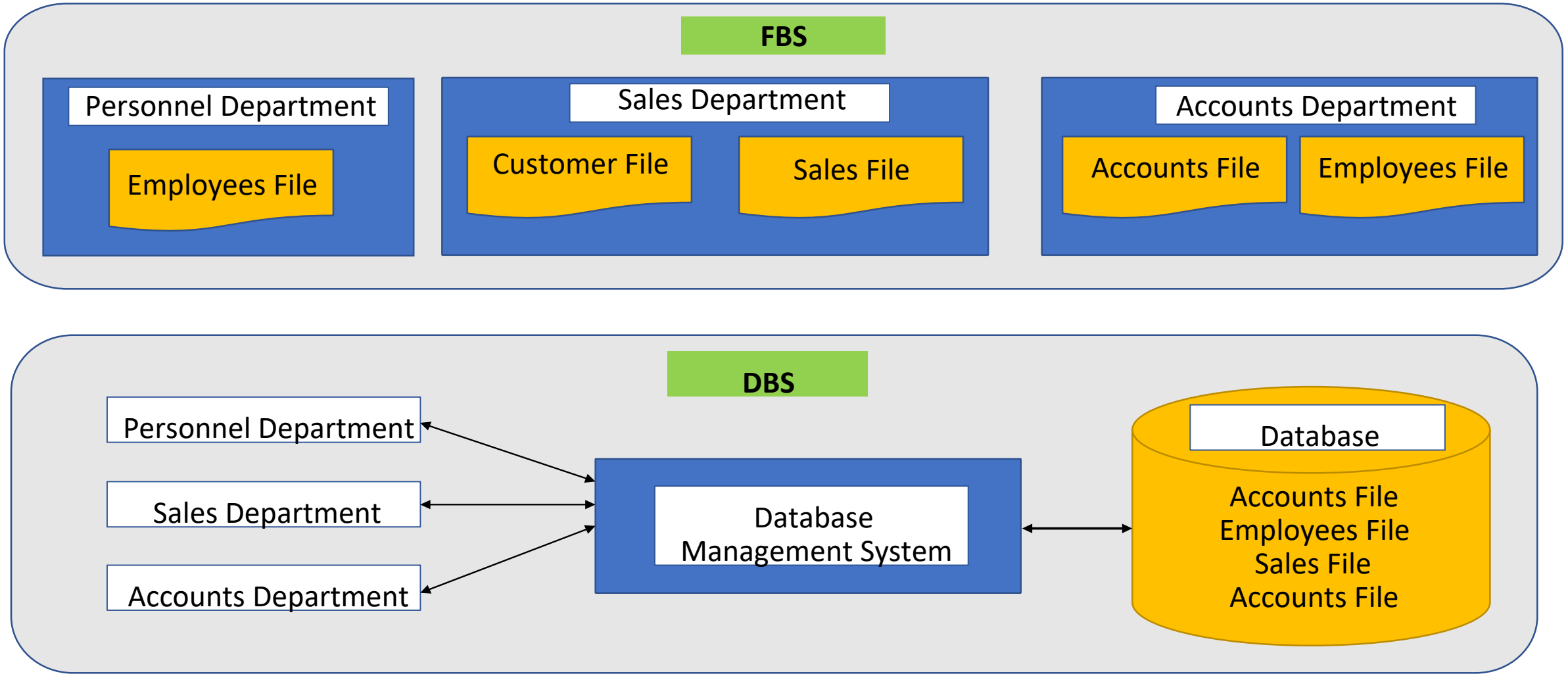
FILE SYSTEM CRITIQUES

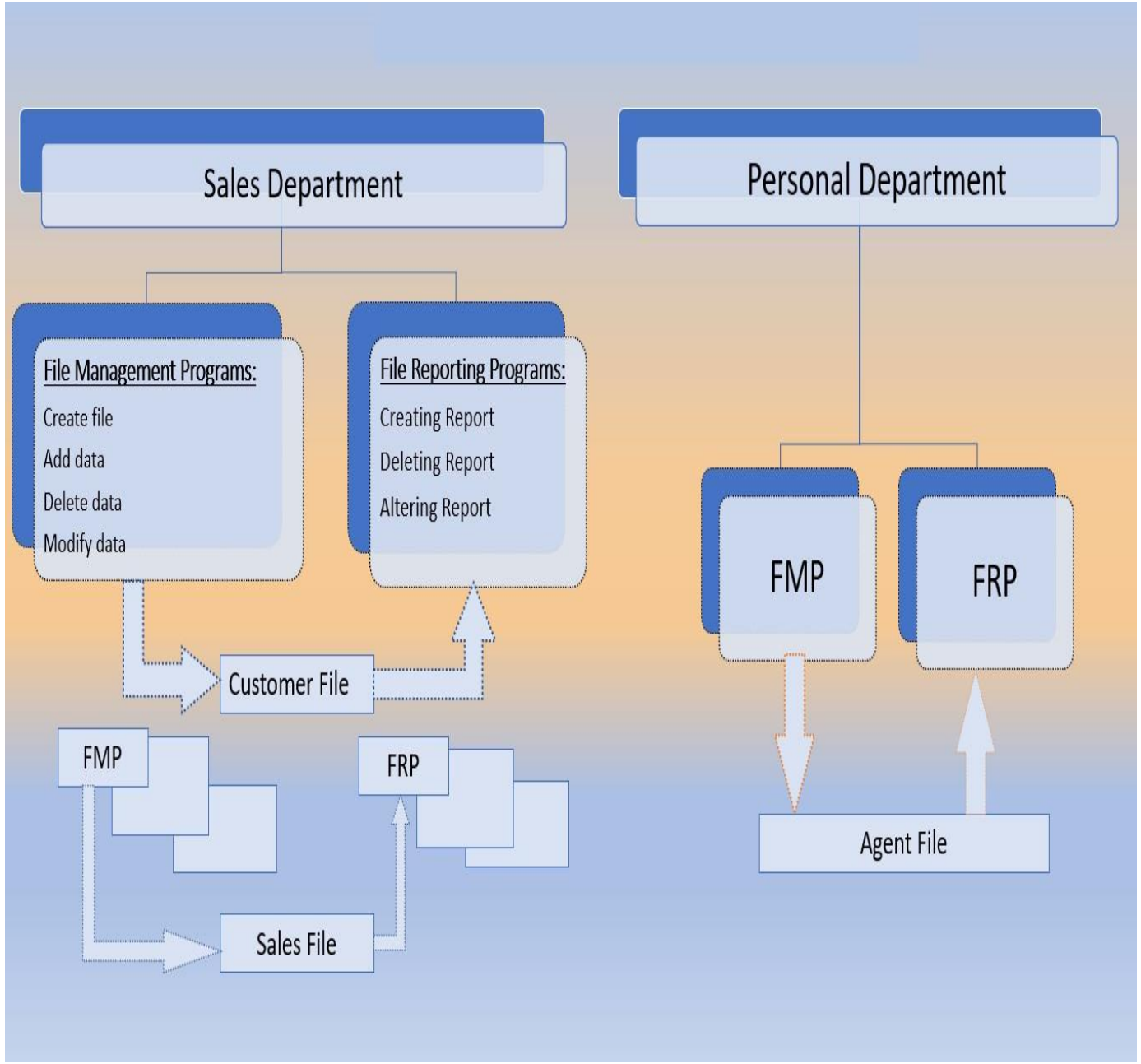
1. File System Data Management
2. Structural Dependence
3. Data Dependence
4. Data Redundancy
    - a) Data Inconsistency
        - i) Integrity Problems
    - b) Data Anomalies
        - i) Modification / Update Anomalies
        - ii) Insertion Anomalies
        - iii) Deletion Anomalies
5. Concurrency Access
6. Data Security

DATABASE SYSTEM



CONTRASTING FBS & DBS

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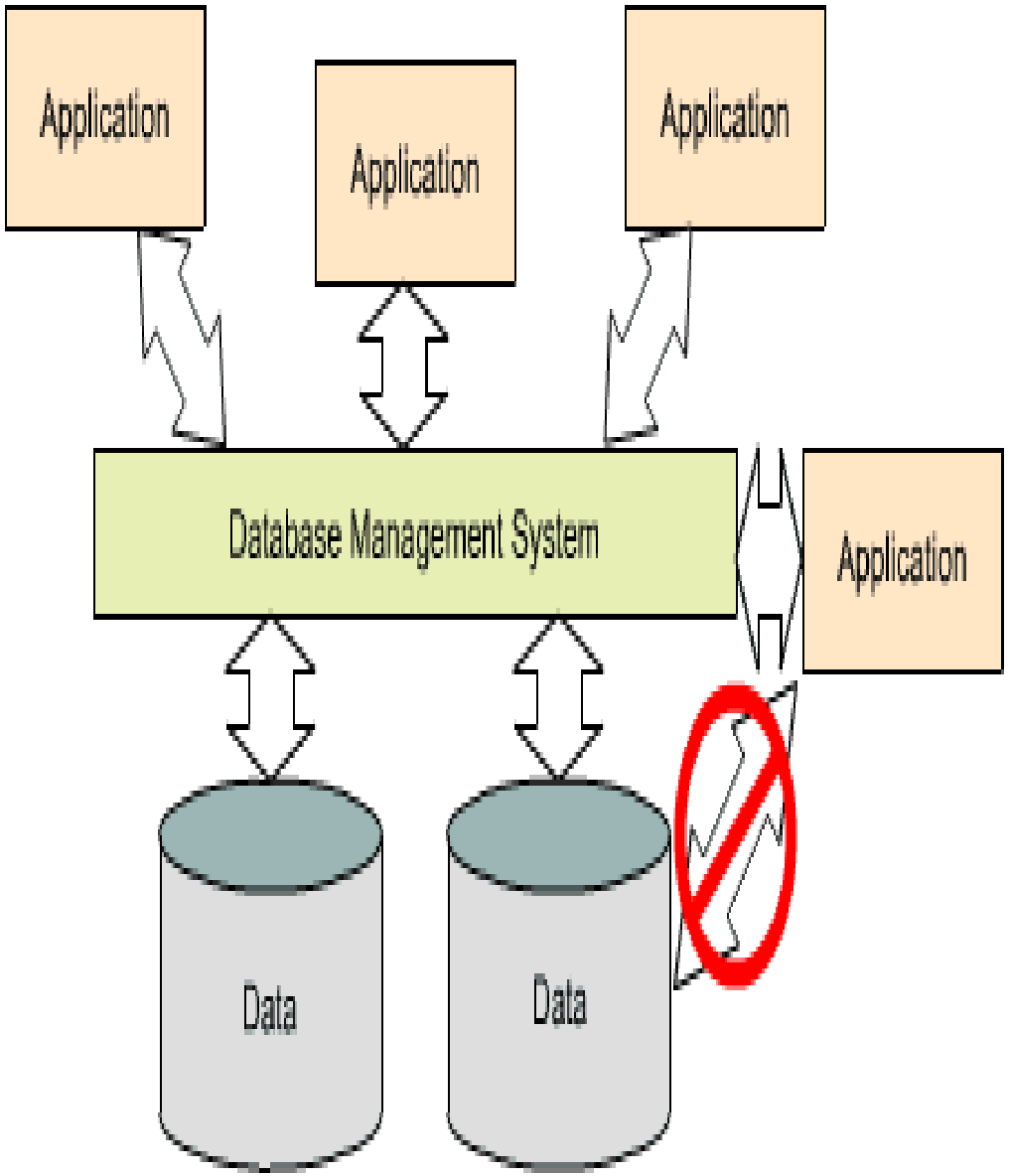

Application
Application
Application
Database Management System
Application
Data
Data

WHAT IS A DATABASE ?

Database is a shared collection of logically related data.

Or

Database is an organized collection of electronically stored data.

DATABASE MANAGEMENT SYSTEM

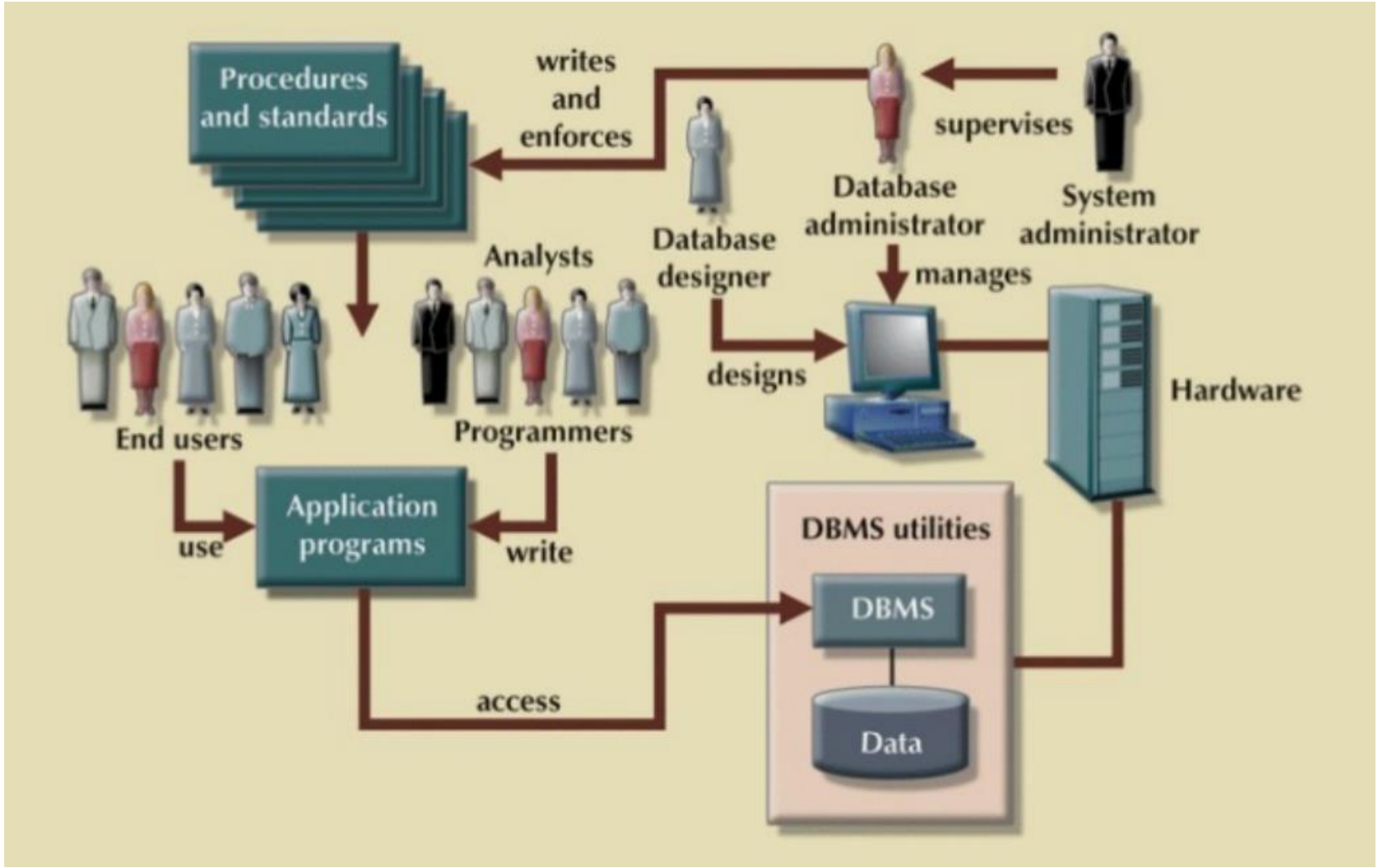
DBMS is a software that is used to create and maintain a database.

Or

A Database Management System (DBMS) is software designed to store, retrieve, define, and manage data in a database.

DATABASE MANAGEMENT SYSTEMS

THE DATABASE SYSTEM ENVIRONMENT



1. **Hardware:** refers to all the system's physical devices; for example, computers, storage devices, printers, network devices etc.

2. **Software:** To make the database system work properly, three types of software are needed:
   a) *Operating system:* It manages all hardware components and allows other software to run on the computers. Examples of operating system software include Windows, Linux etc.
   b) *DBMS software:* It manages the database within the database system. Some examples of DBMS software include Oracle, Access, MySQL etc.
   c) *Application programs:* These are used to access and manipulate data in the DBMS and to manage the computer environment in which data access and manipulation take place.

3. **People:** This component includes all users of the database system. According to the job nature, five types of users can be identified:
   a) *System administrators:* They supervise the database system's general operations.
   b) *Database administrators:* They are also known as DBAs. They manage the DBMS and ensure that the database is functioning properly.
   c) *Database designers:* They design the database structure. They are the database architects.

d) *Systems analysts and programmers:* They design and implement the application programs. They design and create the data entry screens, reports, and procedures through which end users can access and manipulate the data.

e) *End users:* They are the people who use the application programs to run the organization's daily operations. For example, sales-clerks, supervisors, managers are classified as end users.

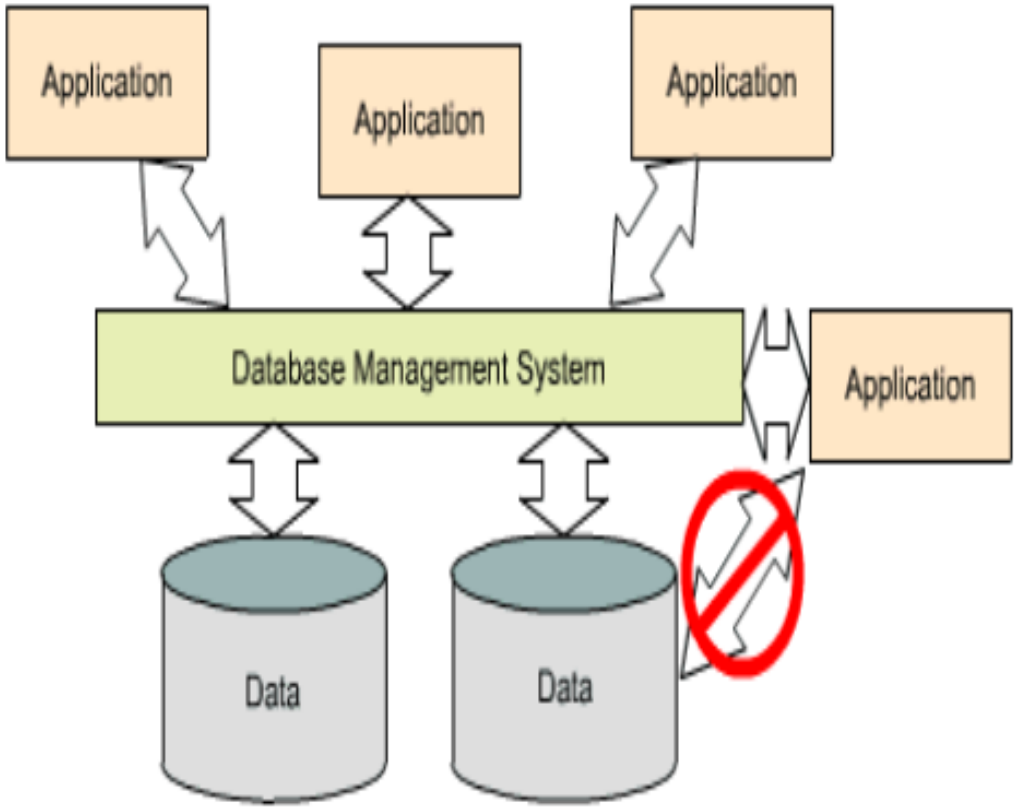
4. **Procedures:** Procedures are the instructions and rules that supervise the design and use of the database system. Procedures play an important role in a company because they enforce the standards by which business is conducted in an organization

5. **Data:** Data refers the collection of facts stored in the database. Because data are the raw material from which information is generated, no database can exist without data.

store
products
customers
orders
MySQL
php
Ruby
Perl
python

BENEFITS OF DATABASE SYSTEM

1. Concurrent Use
2. Structured & Described Data:
3. Seperation of Data & Application
4. Data Integrity
5. Transactions
6. Data Views
7. Access Control
8. Scalability
9. Backup & Recovery
10. Security



ACID TRANSACTIONS

A database transaction is a single logical unit of work which accesses & possibly modifies the contents of a db, in order to maintain consistency in db before & after transaction certain properties are followed called as ACID properties.

- **AUTOMICITY** is also known as "all or nothing rule" transaction either occurs or not (no midway).Involves 2 operation abort or commit.
- **CONSISTENCY** integrity constraints must be maintained so that the db is consistent before and after the transaction.
- **ISOLATION** this properly ensures that multiple transactions can occur concurrently without leading to inconsistency of db state.
- **DURABILITY** This properly ensures that once the transaction has completed execution, the updates & modification to the db are stored in and written to disk & they persist even if system failure occurs. Transactions become permanent & are stored in nonvolatile memory, thus effects of transactions are never lost.

DIFFERENT VIEWS OF A DATABASE

Database Administrator: Whole database | Administration: Statistics about Resits | Classes: Student Lists | Lecturer G5: Class Information

Matriculation	Name	Prename	Address	Institute	Term	Resit	...
99034	Müller	Josef	Oberwil	G	3	N	
99035	Meier	Peter	Regensdorf	G	3	Y	
99036	Keiser	Mirjam	Muttenz	G	3	N	
99037	Muster	Hans	Jägersdorf	G	3	N	
98052	Kunz	Jakob	Bichwil	G	5	N	
98053	Sutter	Ruth	Malhausen	G	5	N	
98054	Weber	Karl	Burgau	G	5	N	
98055	Beck	Karin	Lefendorf	G	5	N	
98056	Schmid	Jürg	Nebelburg	C	5	Y	
98057	Lüthi	Fritz	Sonnwil	C	5	N	

Different Data Views

Database Administrator: Whole database | Administration: Statistics about Resits | Classes: Student Lists | Lecturer G5: Class Information

	Name	Prename	Address				
	Müller	Josef	Oberwil				
	Meier	Peter	Regensdorf				
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	Muster	Hans	Jägersdorf				
	Kunz	Jakob	Bichwil				
	Sutter	Ruth	Malhausen				
	Weber	Karl	Burgau				
	Beck	Karin	Lefendorf				
	Schmid	Jürg	Nebelburg				
	Lüthi	Fritz	Sonnwil				

DISADVANTAGES OF DATABASE SYSTEM

1. **Increased Cost**
2. **Management Complexity**
3. **Qualified Personnel**
4. **Frequent Upgrades**