

# INTRODUCTION

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Engr. Laraib Siddiqui

# Course Learning outcomes

- **Define** database concepts like Data Models, functional dependencies, transaction processing, concurrency control and recovery techniques etc.
- **Explain** the concepts and working mechanism related to Data Models, dependencies, normalization, transactions etc.
- **Apply** appropriate database techniques such as relation algebra, SQL queries, Transaction management, and concurrency management to create solution for different problems.
- **Design** an appropriate database structure for a given business scenario using methods such as:
  - Entity relationship diagrams &
  - Database normalization

# Course Content

## Reference Books:

- Carlos Coronel, Steven Morris and Peter Rob. **Database Systems: Design, Implementation, and Management**, 2016 (12th edition).
- Abraham Silberschatz, Henry F. Korth S. Sudarshan. **"Database System Concepts"**.
- C. J. Date, **Database Systems**, Addison Wesley Pub. Co.
- R. Elmasri and S. Navathe. **Fundamentals of Database Systems**, Benjamin/Cummings.
- T.Connolly and C.Begg. **"Database Systems, a Practical Approach to Design, Implementation and Management"**, Pearson education.

# Key Terms

- Data - **Facts** concerning things, such as people, objects, or events
- Database - shared collection of **logically related data** that is **stored** to meet the requirements of different users of an organization.
- Meta data - provide a description of the **data characteristics** and the set of relationships that links the data found within the database
- Database management system - A software that handles **all access** to the database.
- Database administrator - A person who has **central control** over data and programs that access this data
- Data model - is a **collection of concepts** for describing data.
- Schema - is a **description** of a particular **collection of data**, using the a given data model.
- Relation - a table with **rows** and **columns**.

# Why Use a Database System?

- Data independence and efficient access.
- Reduced application development time.
- Data integrity and security.
- Uniform data administration.
- Concurrent access, recovery from crashes.

# Applications

## ✓ Enterprise Applications

- Sales: for customer, product, and purchase information.
- Accounting: for payments, receipts, account balances, assets and other accounting information.
- Human resources: for information about employees, salaries, payroll taxes, and benefits, and for generation of paychecks.
- Manufacturing: for management of the supply chain and for tracking
- Production of items in factories, inventories of items in warehouses and stores

## ✓ Online retailers

for sales data noted above plus online order tracking, generation of recommendation lists, and maintenance of online product evaluations.

## ✓ Airlines

For reservations and schedule information. Airlines were among the first to use databases in a geographically distributed manner.

# Applications

## ✓ Banking and finance

- Banking: for customer information, accounts, loans, and banking transactions.
- Credit card transactions: for purchases on credit cards and generation of monthly statements.
- Finance: for storing information about holdings, sales, and purchases of financial instruments such as stocks and bonds; also for storing real-time
- Market data to enable online trading by customers and automated trading by the firm.

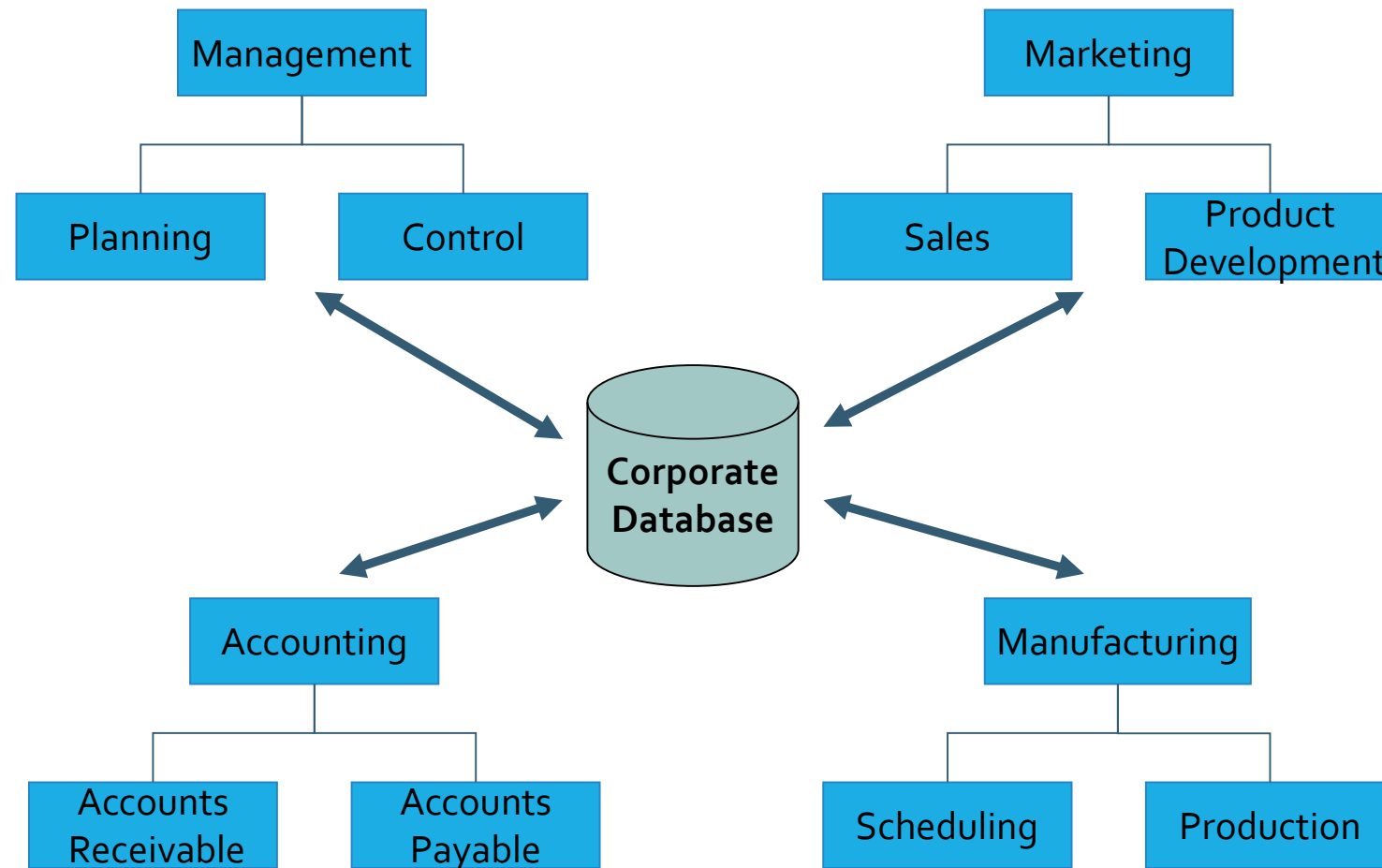
## ✓ Universities

For student information, course registrations, and grades (in addition to standard enterprise information such as human resources etc)

## ✓ Telecommunication

For keeping records of calls made, generating monthly bills, maintaining balances on prepaid calling cards, and storing information about the communication networks.

# The concept of a shared organizational database





# A bit of History

- The 1st general-purpose DBMS was designed by Charles Bachman at General Electric in the early 1960s and was called the Integrated Data Store. It formed the basis for the *network data model* and strongly influenced database systems through the 1960s.
- In the late 1960s, IBM developed the Information Management System (IMS) DBMS, used even today in many major installations. IMS formed the basis for an alternative data representation framework called the *hierarchical data model*.
- In 1970, Edgar Codd, at IBM's San Jose Research Laboratory, proposed a new data representation framework called the *relational data model*.

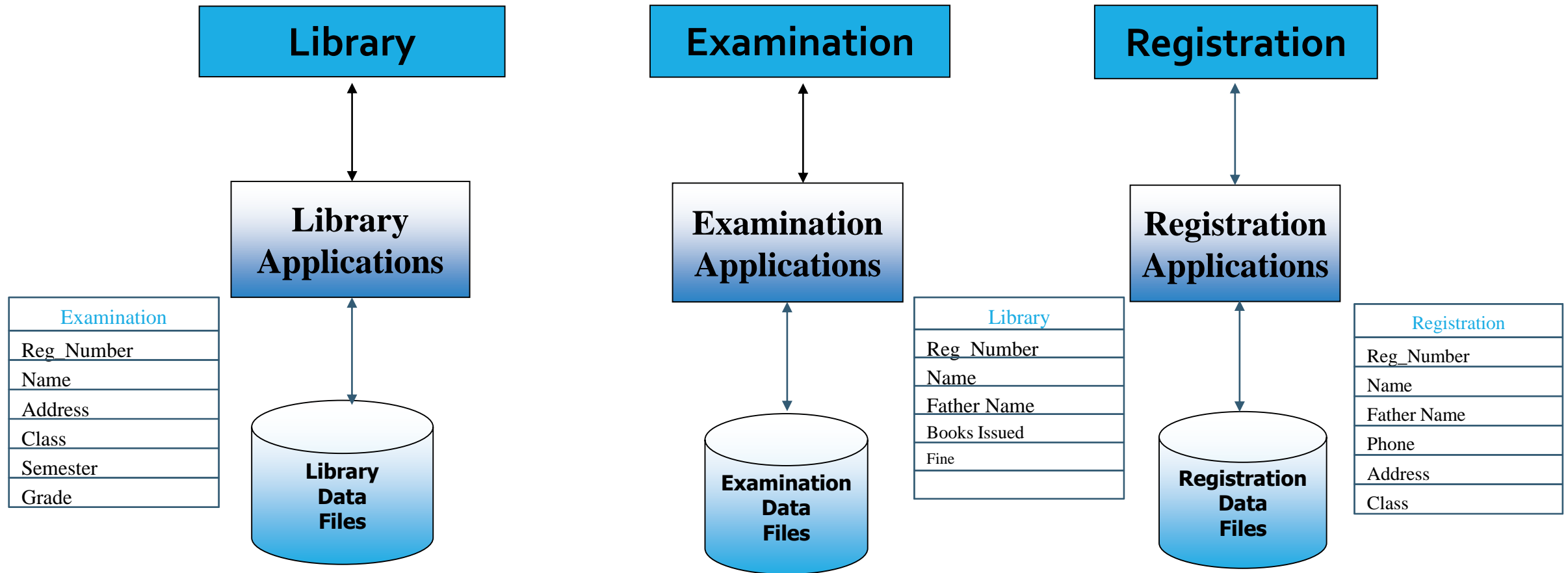
# File Processing System

- ✓ It is a group of files storing data of an organization.
- ✓ Each file is independent from one another.
- ✓ Each file is called a flat file.
- ✓ Each file contained and processed information for one specific function, such as accounting or inventory.
- ✓ Files are designed by using programs written in programming languages such as COBOL, C, C++.

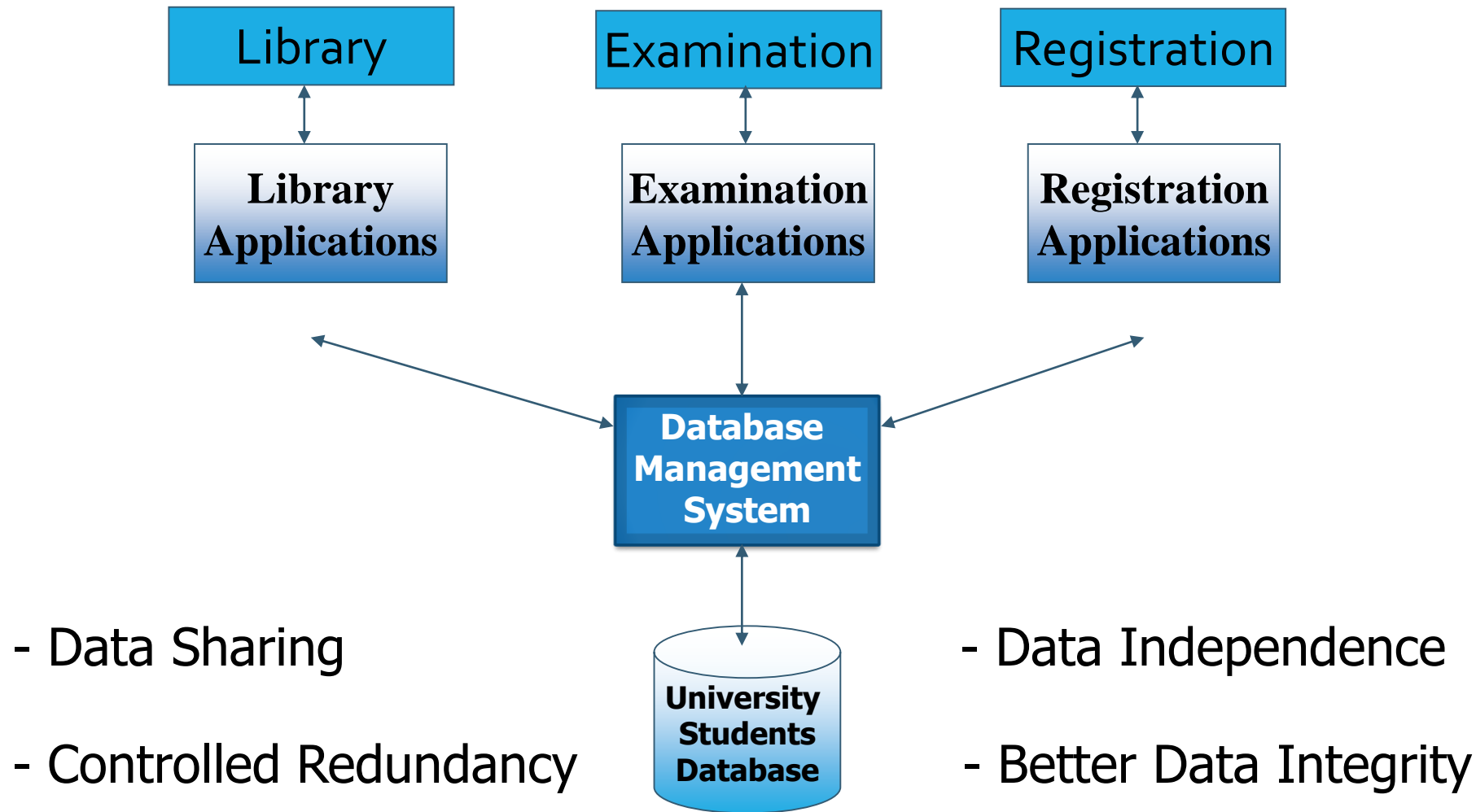
# Limitations of the File Processing System

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

# File Processing Systems



# Advantages of Database Approach



# Database Users

- Application Programmers
- End Users
  - ✓ Naive
  - ✓ Sophisticated
- Database Administrator (DBA)

# Functions of DBA

- Schema definition
- Granting data access
- Routine Maintenance
  - ✓ Backups
  - ✓ Monitoring disk space
  - ✓ Monitoring jobs running

# Data, Database, Data Model and DBMS

