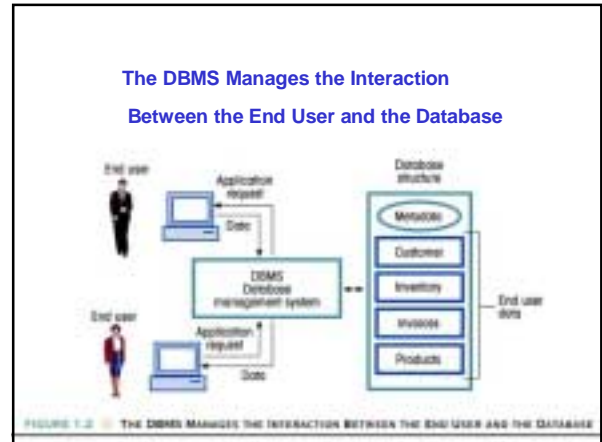


◆ Slide Set 1: File Systems and Databases

Introducing the Database

1

- ❖ Importance of DBMS
 - ◆ It helps make data management more efficient and effective.
 - ◆ Its query language allows quick answers to *ad hoc* queries.
 - ◆ It provides end users better access to more and better-managed data.
 - ◆ It promotes an integrated view of organization's operations – "big picture."
 - ◆ It reduces the probability of inconsistent data.



Introducing the Database

1

- ❖ Why Database Design Is Important?
 - ◆ A well-designed database facilitates data management and becomes a valuable information generator.
 - ◆ A poorly designed database is a breeding ground for uncontrolled data redundancies.
 - ◆ A poorly designed database generates errors that lead to bad decisions.
 - ◆ Poorly Designed databases are "self-correcting". Organization fails! ☹
 - ◆ You can make a big salary! 😊

File Systems - Historical Roots

1

- ◆ Evolutionary historical perspective.
- ◆ Pitfalls of data management example
- ◆ Its simple characteristics facilitate complex database understanding.
- ◆ Synonym = Flat File Database.
- ◆ Spreadsheet programs can be used to create a File System
 - Flat File Database
 - No repeat column header names

Contents of the CUSTOMER File

CUSTOMER	C_PHONE	C_ADDRESS	C_ZIP	A_NAME	A_PHONE	A_ZIP	AGT
JACKIE DAVIS	713-244-2517	214 First St. Suite 30	75201	Jane F. Allen	713-221-1244	75201	00000
JACKIE DAVIS	713-244-2517	214 First St. Suite 30	75201	Jane F. Allen	713-221-1244	75201	00000
JACKIE DAVIS	713-244-2517	214 First St. Suite 30	75201	Jane F. Allen	713-221-1244	75201	00000
JACKIE DAVIS	713-244-2517	214 First St. Suite 30	75201	Jane F. Allen	713-221-1244	75201	00000
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JACKIE DAVIS	713-244-2517	214 First St. Suite 30	75201	Jane F. Allen	713-221-1244	75201	00000
JACKIE DAVIS	713-244-2517	214 First St. Suite 30	75201	Jane F. Allen	713-221-1244	75201	00000
JACKIE DAVIS	713-244-2517	214 First St. Suite 30	75201	Jane F. Allen	713-221-1244	75201	00000

CNAME = Customer name A_NAME = Agent name
 C_PHONE = Customer phone A_PHONE = Agent phone
 C_ADDRESS = Customer address ST = Inactive flag
 C_ZIP = Customer ZIP code AGT = Insurance policy agent's ID number if 9
 9999 = Insurance company ID

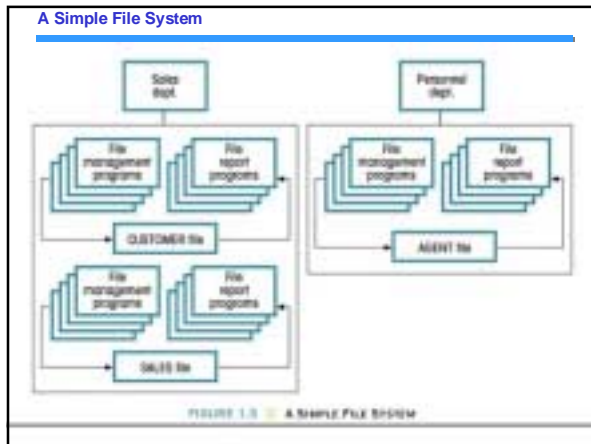
FIGURE 1.3 Contents of the CUSTOMER File

Data Organization

1

- ❖ Data Value (Cells)
 - ◆ Contents of a field contained in a record
 - ◆ "Raw Facts" that can be recognized
- ❖ Fields or Attributes (Columns)
 - ◆ Group of characters representing something
- ❖ Records or Entities or Tuples (Rows)
 - ◆ Collection of related fields
- ❖ Tables or Entity Set (File)
 - ◆ Collection of related records

◆ Slide Set 1: File Systems and Databases

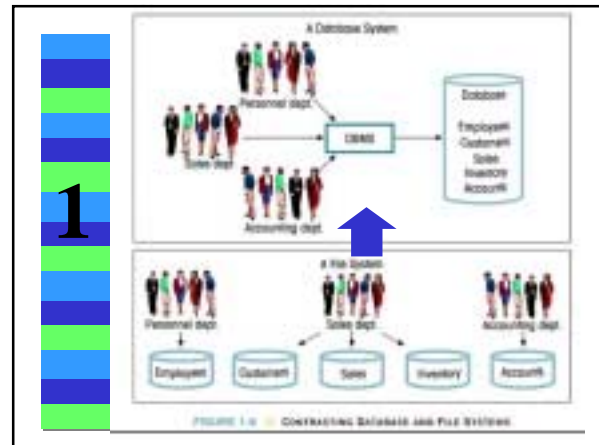


File System Environment

- ❖ Information System approach
 - ◆ Bottom-Up Process
 - ◆ Individual departments design and control data
 - ◆ Organization needs must utilize this dissimilar data
- ❖ Disadvantages
 - (a) uncontrolled redundancy – duplicate data
 - (b) inconsistencies – lack of data integrity
 - (c) inflexibility – can't respond to new requests
 - (d) limited data sharing – increases data duplication
 - (e) poor enforcement of standards – decentralized file design
 - (f) excessive program maintenance – modify data means change to program

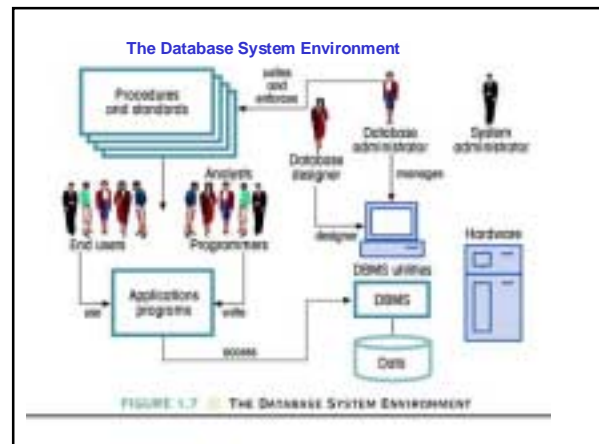
File System Critique

- ❖ File System Data Management
 - ◆ File systems require extensive programming in a third-generation language (3GL).
 - ◆ As the number of files expands, system administration becomes difficult.
 - Making changes
 - Security difficult to program.
- ❖ Structural and Data Dependence
 - ◆ Structural Dependence
 - A change in any file's structure requires the modification of all programs using that file.
 - ◆ Data Dependence
 - A change in any file's data characteristics requires changes in all data access programs.



Database Systems

- ❖ People
 - ◆ Systems administrators
 - ◆ Database administrators (DBAs)
 - ◆ Database designers
 - ◆ Systems analysts and programmers
 - ◆ End users
- ❖ Procedures
 - ◆ Instructions and rules that govern the design and use of the database system
- ❖ Data
 - ◆ Collection of facts stored in the database



◆ Slide Set 1: File Systems and Databases

❖ Types of Database Systems

- ◆ Number of Users & Scope
 - Single-user
 - Desktop database
 - Multiuser
 - Workgroup database
 - Enterprise database
- ◆ Location
 - Centralized
 - Distributed
- ◆ Use
 - Transactional (Production)
 - Decision support
 - Data warehouse

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❖ DBMS Functions

1. Data Dictionary Management
2. Data Storage Management
3. Data Transformation and Presentation
4. Security Management
5. Multi-User Access Control
6. Backup and Recovery Management
7. Data Integrity Management
8. Database Access Languages (DDL and DML) and Application Programming Interfaces
9. Database Communication Interfaces

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Database model

collection of logical constructs used to represent the data structure and the data relationships found within the database.

- ◆ **Conceptual models** focus on *what* is represented rather than *how* it is represented.
 - Entity Relationship Diagram
 - Object Oriented Model
- ◆ **Implementation models** emphasis on *how* the data is represented in the database or on *how* the data structures are implemented.
 - Hierarchical Database Model
 - Relational Database Model
 - Object Oriented Database Model

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Database Conceptual Model

❖ Three Types of Relationships

- ◆ **One-to-many relationships (1:M)**
 - A painter paints many different paintings, but each one of them is painted by only that painter.
 - PAINTER (1) paints PAINTING (M)
- ◆ **Many-to-many relationships (M:N)**
 - An employee might learn many job skills, and each job skill might be learned by many employees.
 - EMPLOYEE (M) learns SKILL (N)
- ◆ **One-to-one relationships (1:1)**
 - Each store is managed by a single employee and each store manager (employee) only manages a single store.
 - EMPLOYEE (1) manages STORE (1)

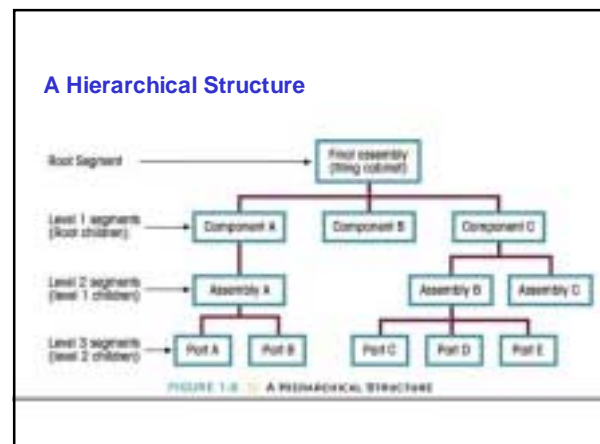
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Hierarchical Database Implementation Model

❖ Basic Structure

- ◆ Collection of records logically organized to conform to the upside-down tree (hierarchical) structure.
- ◆ The top layer is perceived as the parent of the segment directly beneath it.
- ◆ The segments below other segments are the children of the segment above them.
- ◆ A tree structure is represented as a hierarchical path on the computer's storage media.

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◆ Slide Set 1: File Systems and Databases

Hierarchical Database Model

- ❖ Advantages
 - ◆ Conceptual simplicity
 - ◆ Database security
 - ◆ Data independence
 - ◆ Database integrity
 - ◆ Efficiency dealing with a large database
- ❖ Disadvantages
 - ◆ Complex implementation
 - ◆ Difficult to manage
 - ◆ Lacks structural independence
 - ◆ Applications programming and use complexity
 - ◆ Implementation limitations (Child with Multiple Parents)
 - ◆ Lack of standards

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Relational Database Implementation Model

- ❖ Basic Structure
 - ◆ Relational DataBase Management Systems (RDBMS) allows operations in a human logical environment.
 - ◆ The relational database is perceived as a collection of tables.
 - ◆ Each table consists of a series of row/column intersections.
 - ◆ Tables (or relations) are related to each other by sharing a common entity characteristic.
 - ◆ The relationship type is often shown in a relational schema.
 - ◆ A table yields data and structural independence.
 - ◆ Microsoft Access is a RDBMS

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Linking Relational Tables

FIGURE 1.11 Linking Relational Tables

Relational Database Model

- ❖ Advantages
 - ◆ Structural independence
 - ◆ Improved conceptual simplicity
 - ◆ Easier database design, implementation, management, and use
 - ◆ Ad hoc query capability (SQL)
 - ◆ Powerful database management system
- ❖ Disadvantages
 - ◆ Substantial hardware and system software overhead
 - ◆ Possibility of poor design and implementation
 - ◆ Potential "islands of information" problems

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A Relational Schema

FIGURE 1.12 A Relational Schema

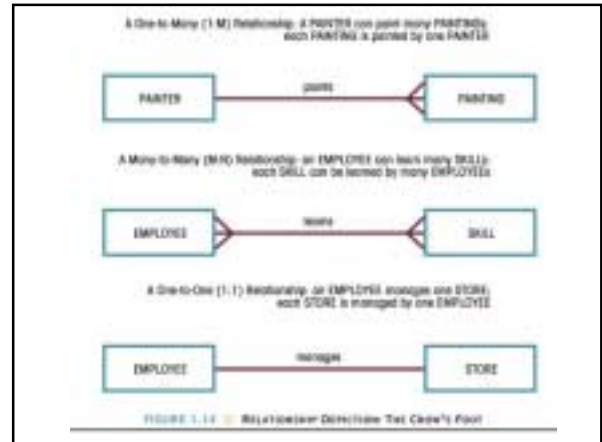
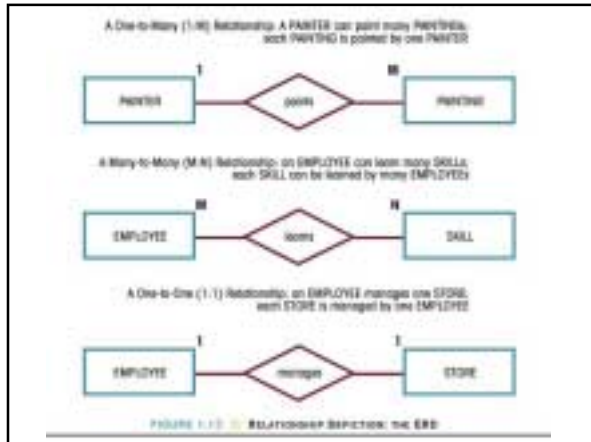
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Entity Relationship Data Model

- ❖ E-R models are normally represented in an Entity Relationship Diagram (ERD).
- ❖ An entity is represented by a rectangle.
 - ◆ Usually a Noun or Object of the sentence.
- ❖ A relationship is represented by a diamond connected to the related entities.
 - ◆ Usually a Verb.
- ❖ An attribute is a characteristic of the entity.
 - ◆ Represented by ellipses connected to entity.
 - ◆ Usually Nouns

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◆ Slide Set 1: File Systems and Databases



Database Models

❖ Object-Oriented Database Model

◆ Characteristics

1. An object is described by its factual content.
2. An object includes information about relationships between the facts within the object, as well as with other objects.
3. An object is a self-contained building block for autonomous structures.

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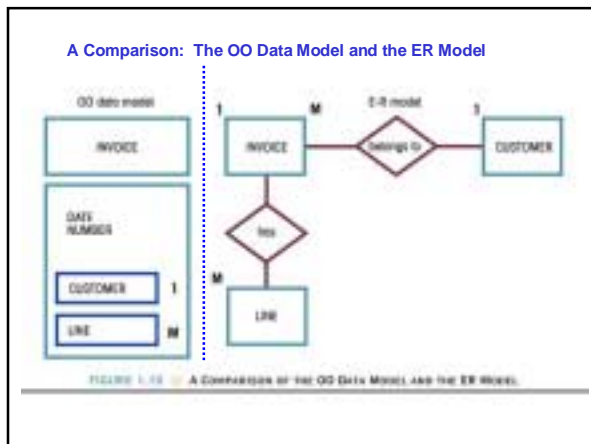
Database Models

❖ Object-Oriented Database Model

◆ Basic Structure

- **Objects** are abstractions of real-world entities or events.
- **Attributes** describe the properties of an object.
- Objects that share similar characteristics are grouped in classes.
- A **class** is a collection of similar objects with shared structure (attributes) and behavior (methods).
- Classes are organized in a class hierarchy.
- An object can inherit the attributes and methods of the classes above it.

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Database Models

❖ Object-Oriented Database Model

◆ Advantages

- Visual presentation
- Database integrity
- Both structural and data independence
- Object Oriented Method with Class Inheritance

◆ Disadvantages

- Lack of Object Oriented Data Model standards
- Complex navigational data access
- Steep learning curve
- High system overhead slows transactions

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