

APPLIED IT FOR BUSINESS

Chapter 5

Data Resource Management

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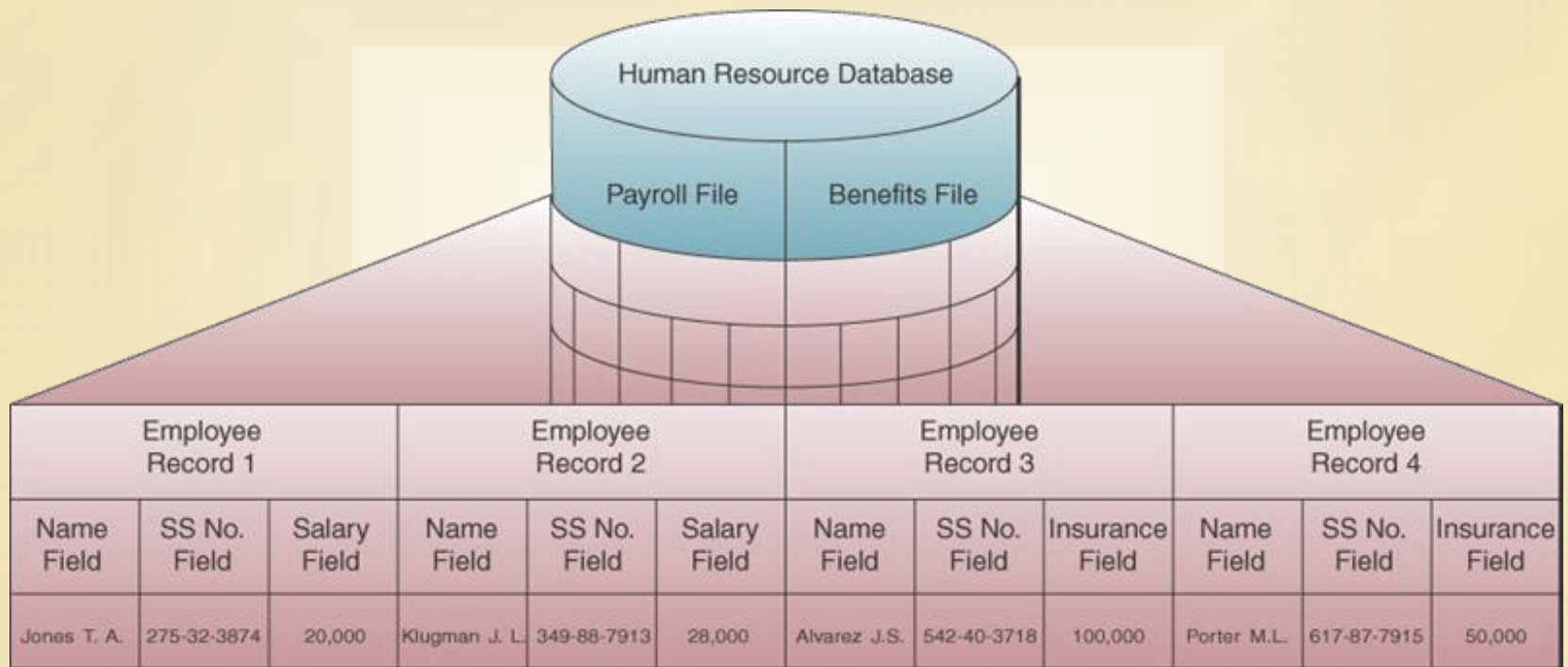
Learning Objectives

- Explain the business value of implementing data resource management processes and technologies in an organization
- Outline the advantages of a database management approach to managing the data resources of a business, compared to a file processing approach
- Explain how database management software helps business professionals and supports the operations and management of a business

Learning Objectives

- Provide examples to illustrate the following concepts
 - Major types of databases
 - Data warehouses and data mining
 - Logical data elements
 - Fundamental database structures
 - Database development

Logical Data Elements



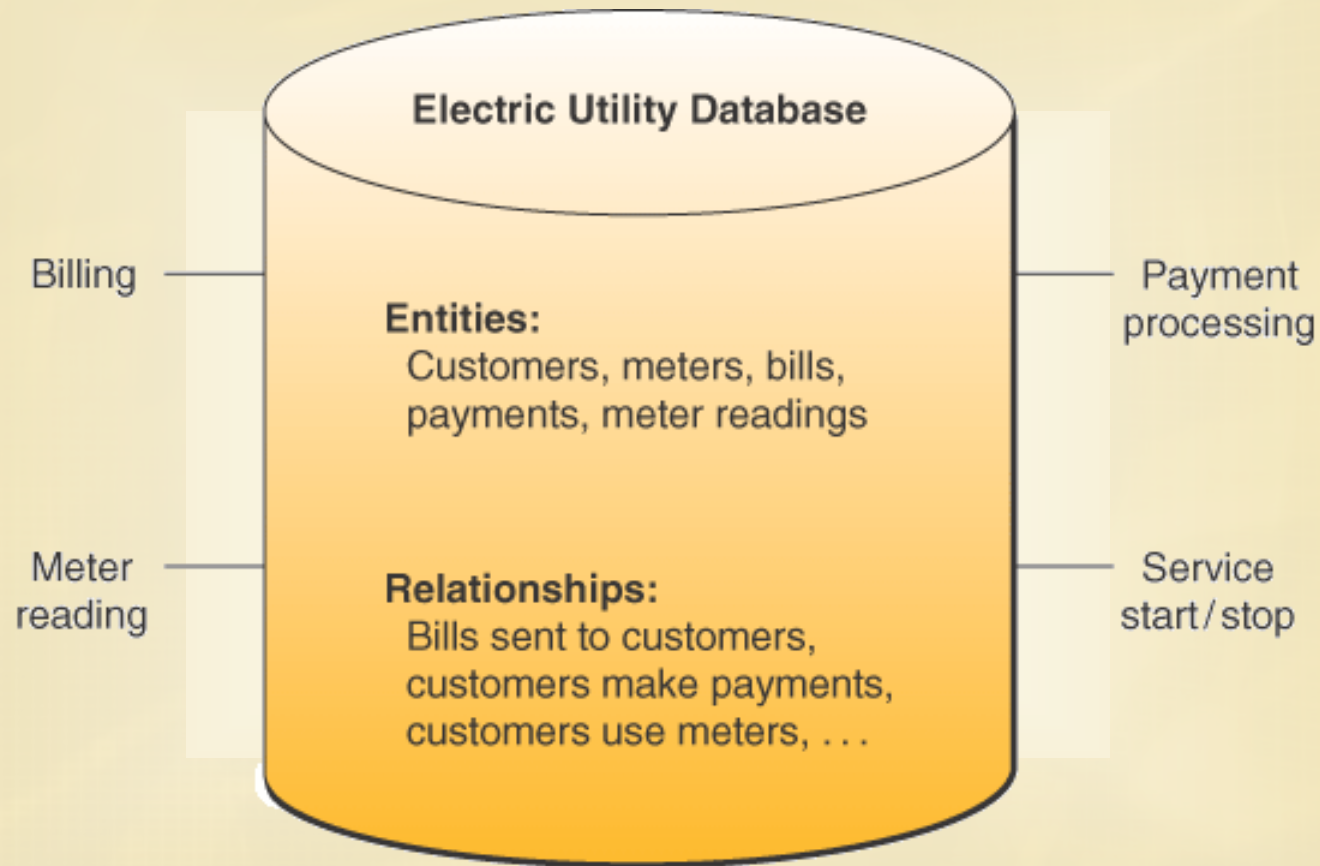
Logical Data Elements

- Character
 - A single alphabetic, numeric, or other symbol
- Field or data item
 - Represents an attribute (characteristic or quality) of some entity (object, person, place, event)
 - Examples: salary, job title
- Record
 - Grouping of all the fields used to describe the attributes of an entity
 - Example: payroll record with name, SSN, pay rate

Logical Data Elements

- File or table
 - A group of related records
- Database
 - An integrated collection of logically related data elements

Electric Utility Database



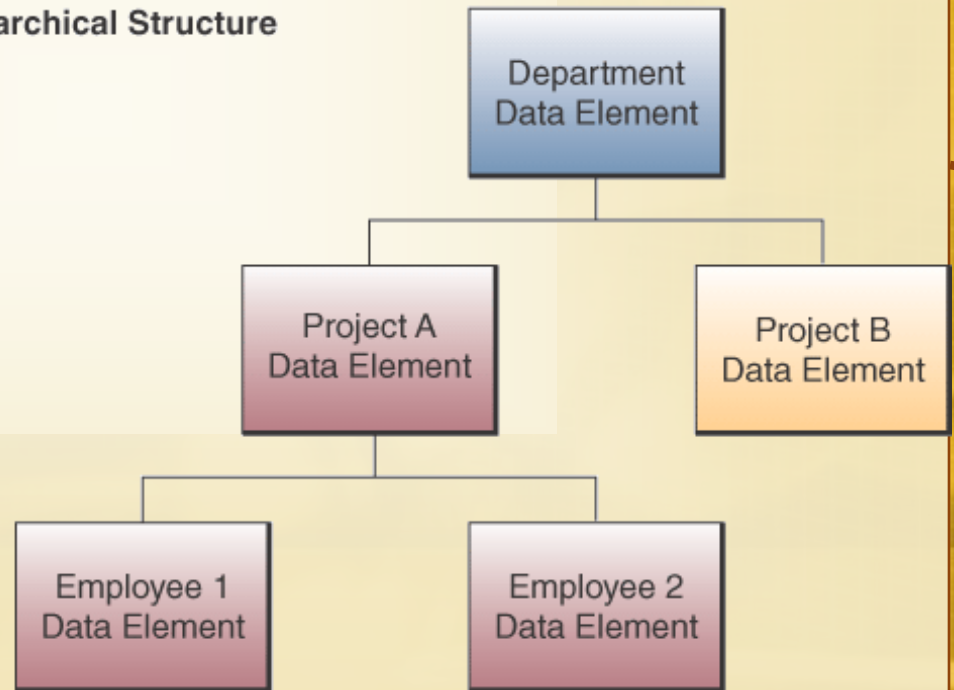
Database Structures

- Common database structures...
 - Hierarchical
 - Network
 - Relational
 - Object-oriented
 - Multi-dimensional

Hierarchical Structure

- Early DBMS structure
- Records arranged in tree-like structure
- Relationships are one-to-many

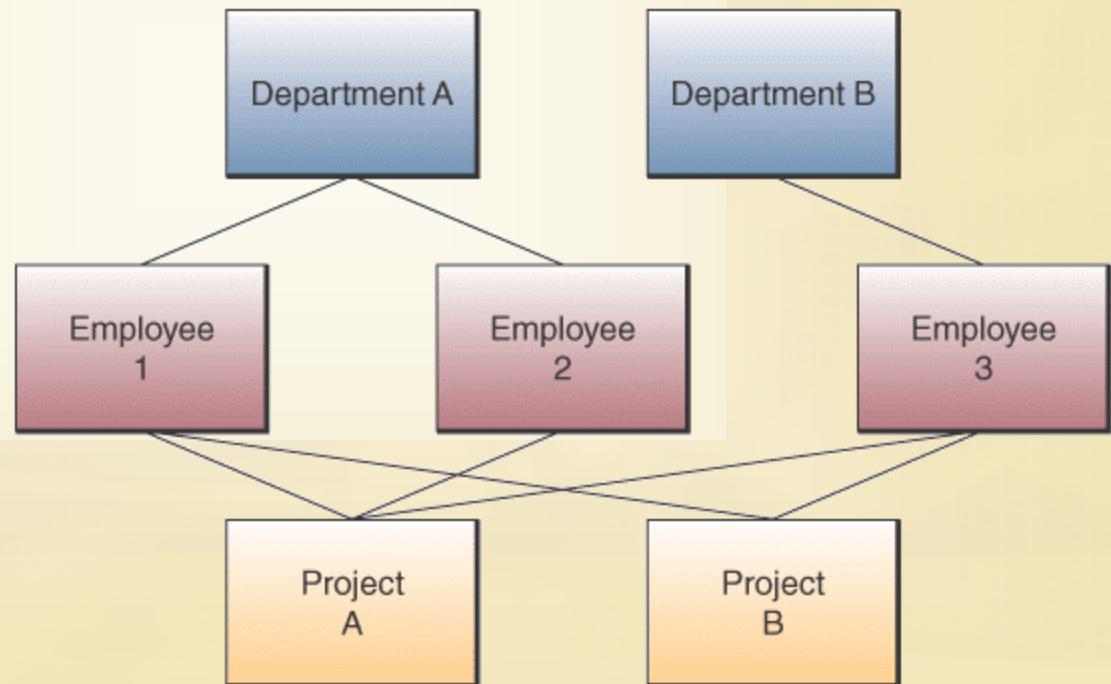
Hierarchical Structure



Network Structure

- Used in some mainframe DBMS packages
- Many-to-many relationships

Network Structure



Relational Structure

Department Table

Deptno	Dname	Dloc	Dmgr
Dept A			
Dept B			
Dept C			

Employee Table

Empno	Ename	Etitle	Esalary	Deptno
Emp 1				Dept A
Emp 2				Dept A
Emp 3				Dept B
Emp 4				Dept B
Emp 5				Dept C
Emp 6				Dept B

- Most widely used structure
 - Data elements are stored in tables
 - Row represents a record; column is a field
 - Can relate data in one file with data in another, if both files share a common data element

Relational Operations

- **Select**
 - Create a subset of records that meet a stated criterion
 - Example: employees earning more than \$30,000
- **Join**
 - Combine two or more tables temporarily
 - Looks like one big table
- **Project**
 - Create a subset of columns in a table

Multidimensional Structure

- Variation of relational model
 - Uses multidimensional structures to organize data
 - Data elements are viewed as being in cubes
 - Popular for analytical databases that support Online Analytical Processing (OLAP)

Multidimensional Model

		Denver			
		Los Angeles			
		San Francisco			
West					
East		February		March	
Sales	Camera	Actual	Budget	Actual	Budget
	TV				
	VCR				
	Audio				
Margin	Camera				
	TV				
	VCR				
	Audio				

		Profit			
		Total Expenses			
		Margin			
COGS					
Sales		East		West	
TV	January	Actual	Budget	Actual	Budget
	February				
	March				
	Qtr 1				
VCR	January				
	February				
	March				
	Qtr 1				

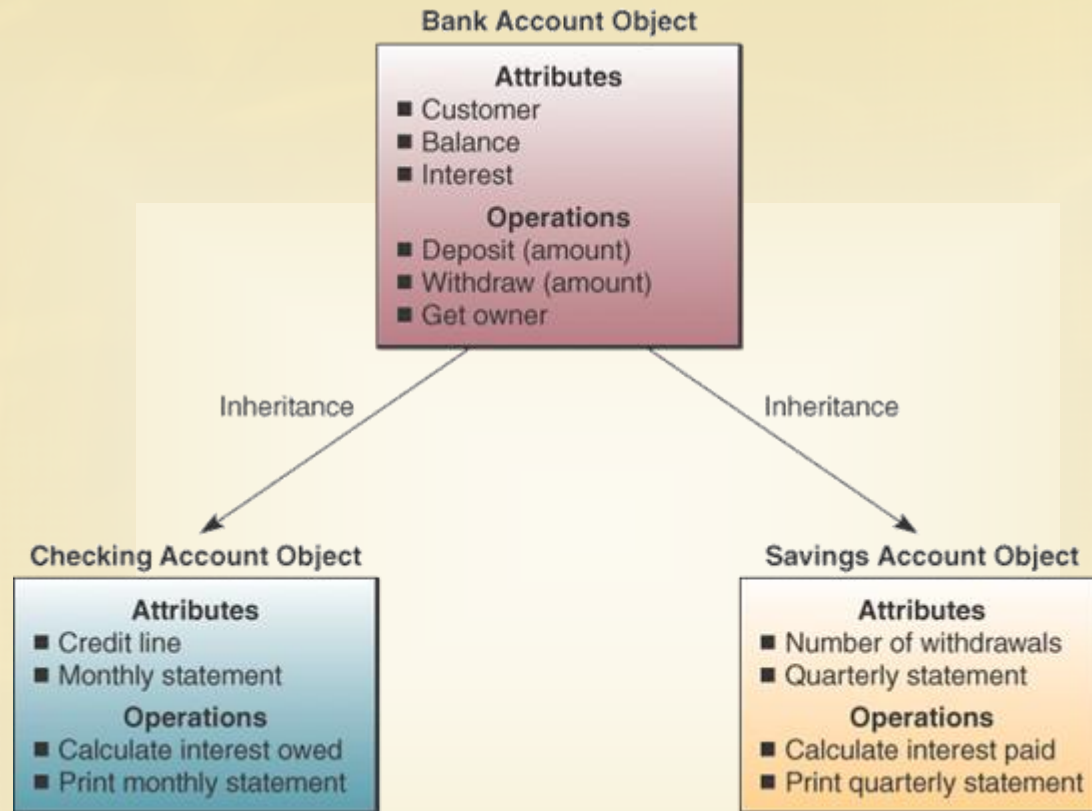
		April			
		Qtr 1			
		March			
February					
January		Actual		Budget	
TV	East	Sales	Margin	Sales	Margin
	West				
	South				
	Total				
VCR	East				
	West				
	South				
	Total				

		April			
		Qtr 1			
		March			
February					
January		Sales		Margin	
East	Actual	TV	VCR	TV	VCR
	Budget				
	Forecast				
	Variance				
West	Actual				
	Budget				
	Forecast				
	Variance				

Object-Oriented Structure

- An **object** consists of
 - Data values describing the attributes of an entity
 - Operations that can be performed on the data
- Encapsulation
 - Combine data and operations
- Inheritance
 - New objects can be created by replicating some or all of the characteristics of parent objects

Object-Oriented Structure



Source: Adapted from Ivar Jacobsen, Maria Ericsson, and Ageneta Jacobsen, *The Object Advantage: Business Process Reengineering with Object Technology* (New York: ACM Press, 1995), p. 65.
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Object-Oriented Structure

- Used in object-oriented database management systems (OODBMS)
- Supports complex data types more efficiently than relational databases
 - Examples: graphic images, video clips, web pages

Evaluation of Database Structures

- Hierarchical
 - Works for structured, routine transactions
 - Can't handle many-to-many relationship
- Network
 - More flexible than hierarchical
 - Unable to handle ad hoc requests
- Relational
 - Easily responds to ad hoc requests
 - Easier to work with and maintain
 - Not as efficient/quick as hierarchical or network

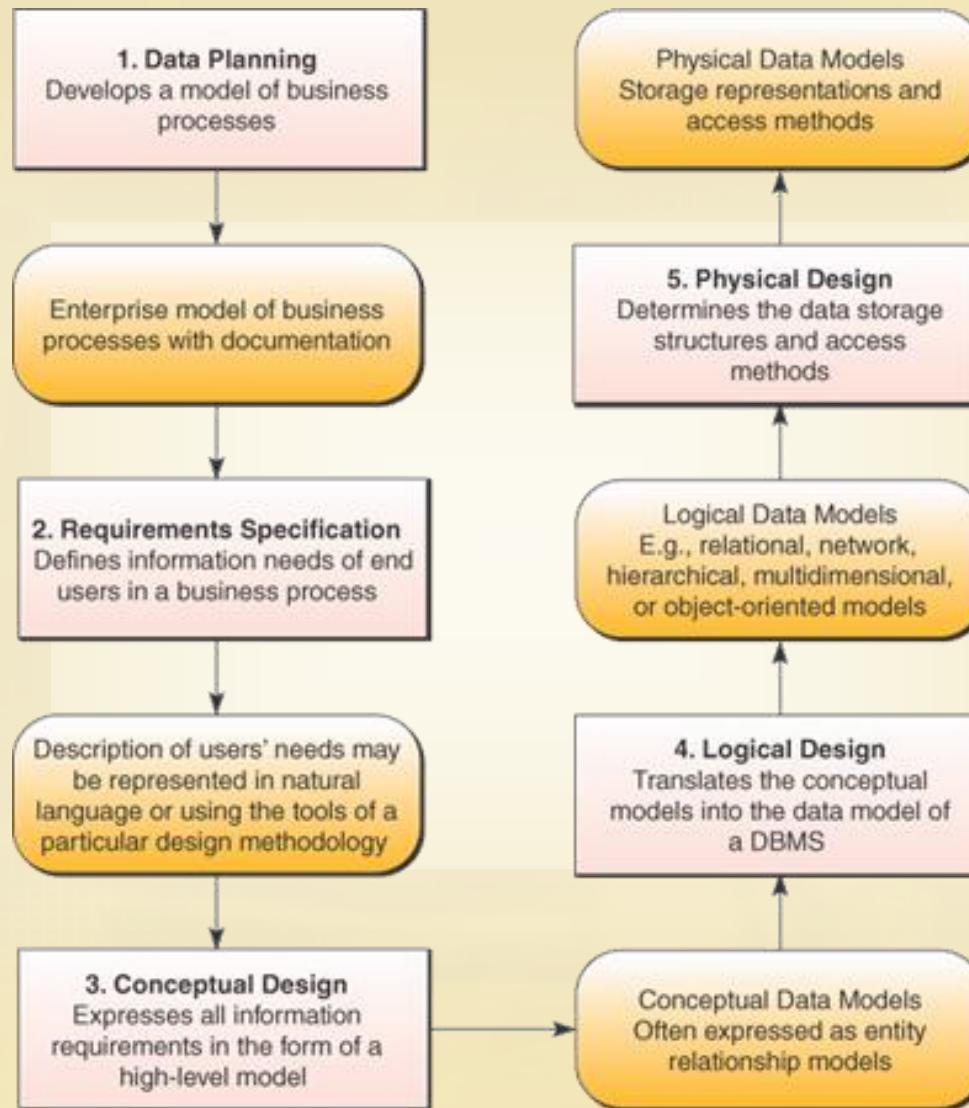
Database Development

- Database Administrator (DBA)
 - In charge of enterprise database development
 - Improves the integrity and security of organizational databases
 - Uses Data Definition Language (DDL) to develop and specify data contents, relationships, and structure
 - Stores these specifications in a data dictionary or a metadata repository

Data Dictionary

- A data dictionary
 - Contains data about data (metadata)
 - Relies on specialized software component to manage a database of data definitions
- It contains information on..
 - The names and descriptions of all types of data records and their interrelationships
 - Requirements for end users' access and use of application programs
 - Database maintenance
 - Security

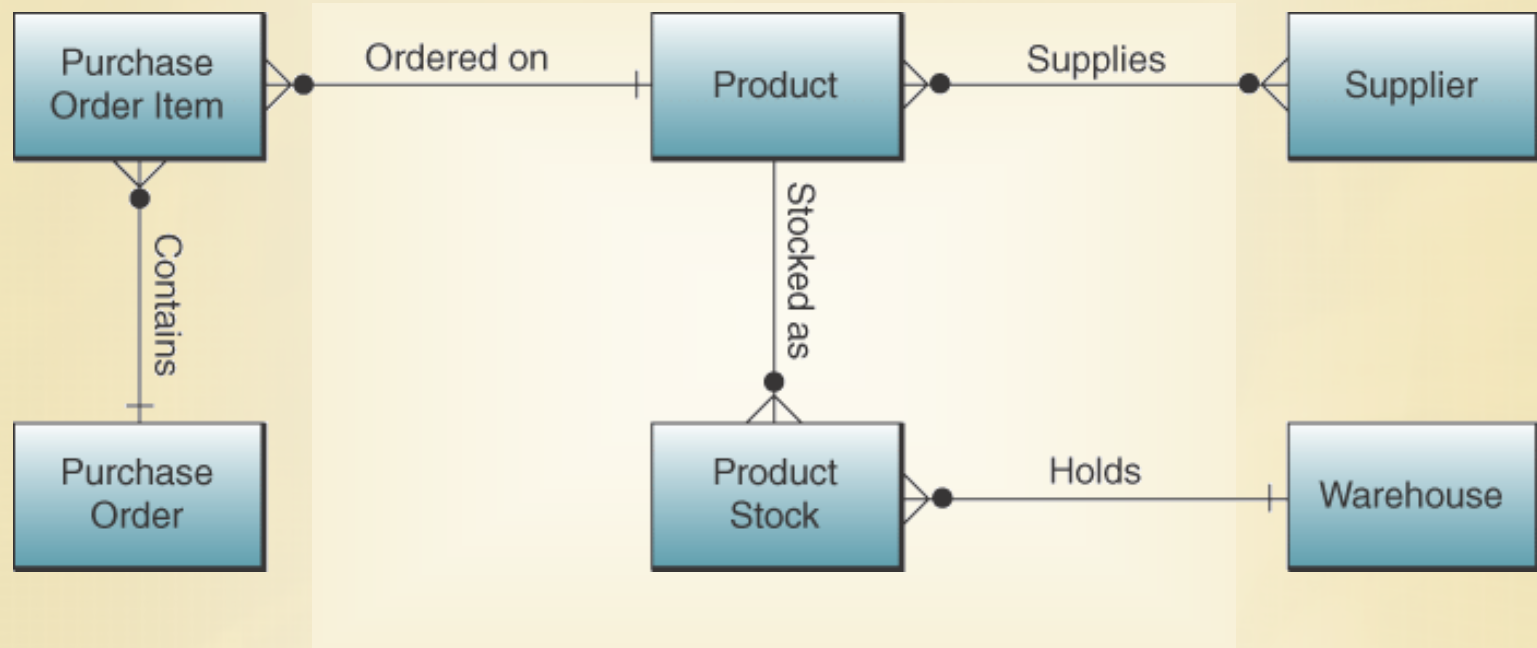
Database Development



Data Planning Process

- Database development is a top-down process
 - Develop an enterprise model that defines the basic business process of the enterprise
 - Define the information needs of end users in a business process
 - Identify the key data elements that are needed to perform specific business activities (entity relationship diagrams)

Entity Relationship Diagram



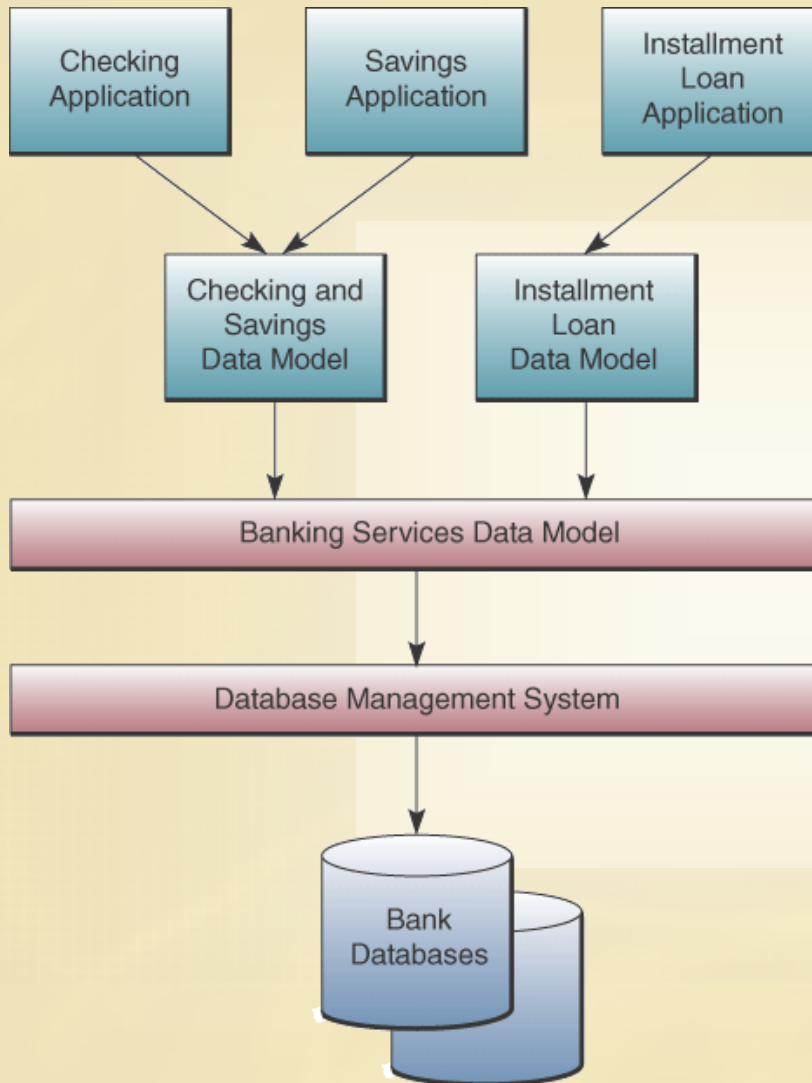
Database Design Process

- Data relationships are represented in a data model that supports a business process
- This model is the **schema** or **subschema** on which to base...
 - The physical design of the database
 - The development of application programs to support business processes

Database Design Process

- Logical Design
 - Schema - overall logical view of relationships
 - Subschema - logical view for specific end users
 - Data models for DBMS
- Physical Design
 - How data are to be physically stored and accessed on storage devices

Logical and Physical Database Views



Logical User Views

Data elements and relationships (the subschemas) needed for checking, savings, or installment loan processing

Data elements and relationships (the schema) needed for the support of all bank services

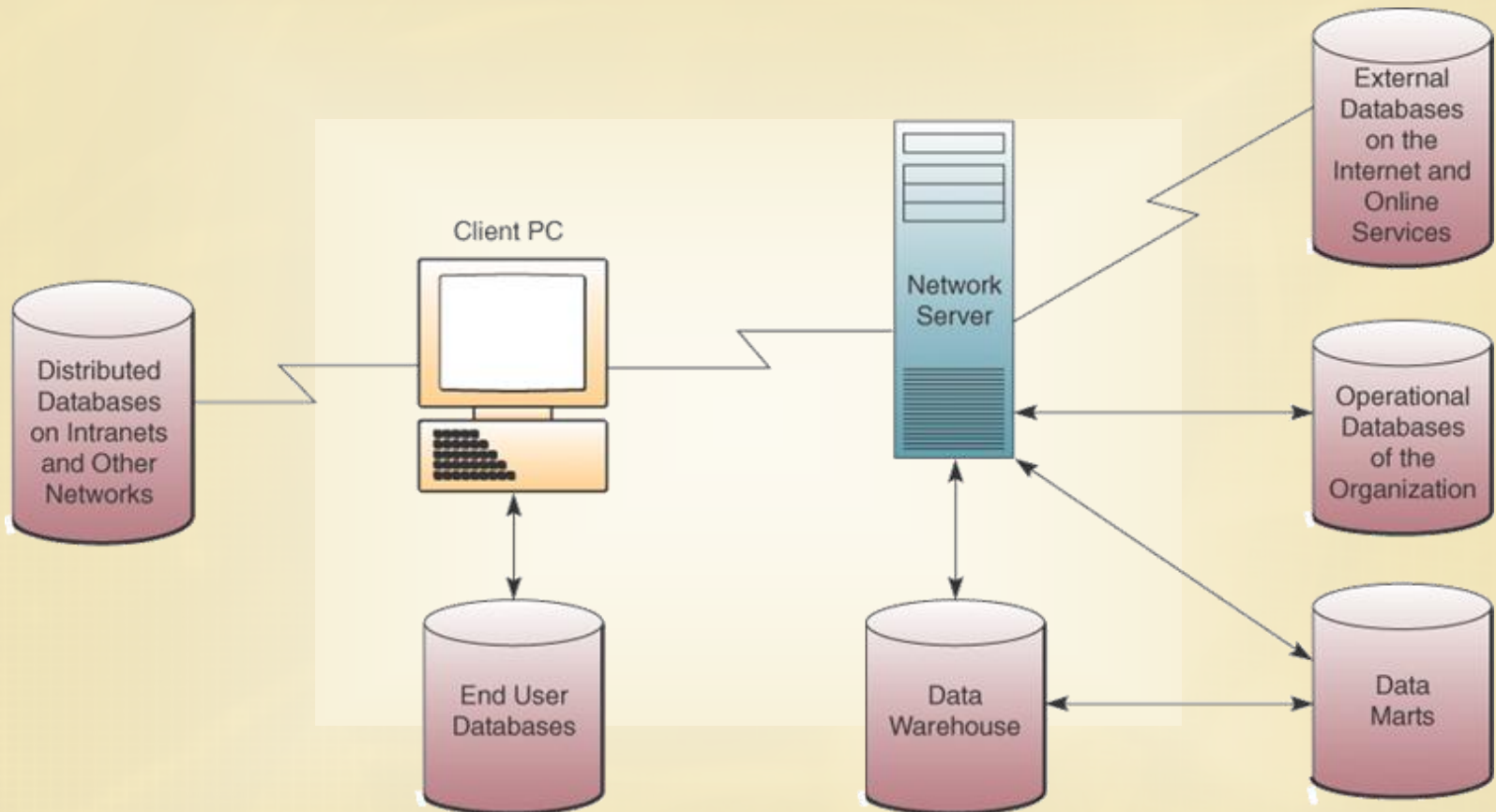
Software Interface

The DBMS provides access to the bank's databases

Physical Data Views

Organization and location of data on the storage media

Types of Databases



Operational Databases

- Stores detailed data needed to support business processes and operations
 - Also called **subject area databases (SADB)**, **transaction databases**, and **production databases**
 - Database examples: customer, human resource, inventory

Distributed Databases

- Distributed databases are copies or parts of databases stored on servers at multiple locations
 - Improves database performance at worksites
- Advantages
 - Protection of valuable data
 - Data can be distributed into smaller databases
 - Each location has control of its local data
 - All locations can access any data, any where
- Disadvantages
 - Maintaining data accuracy

Distributed Databases

- Replication
 - Look at each distributed database and find changes
 - Apply changes to each distributed database
 - Very complex
- Duplication
 - One database is master
 - Duplicate the master after hours, in all locations
 - Easier to accomplish

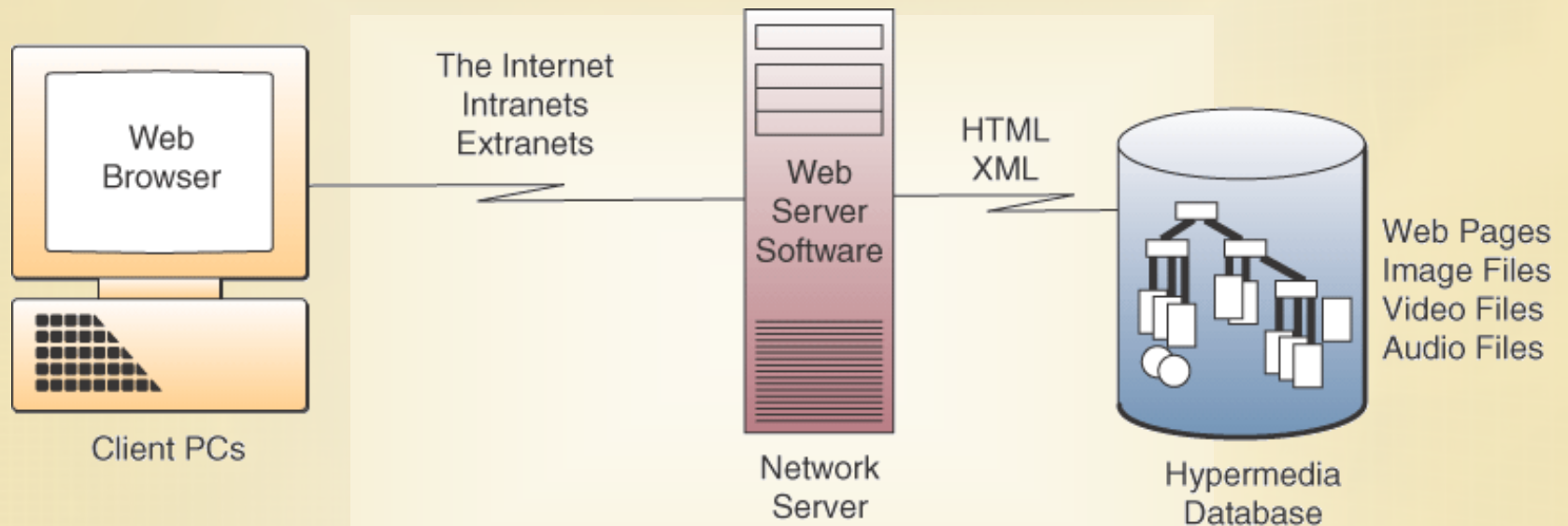
External Databases

- Databases available for a fee from commercial online services, or free from the Web
 - Examples: hypermedia databases, statistical databases, bibliographic and full text databases
 - Search engines like Google or Yahoo are external databases

Hypermedia Databases

- A hypermedia database contains
 - Hyperlinked pages of multimedia
 - Interrelated hypermedia page elements, rather than interrelated data records

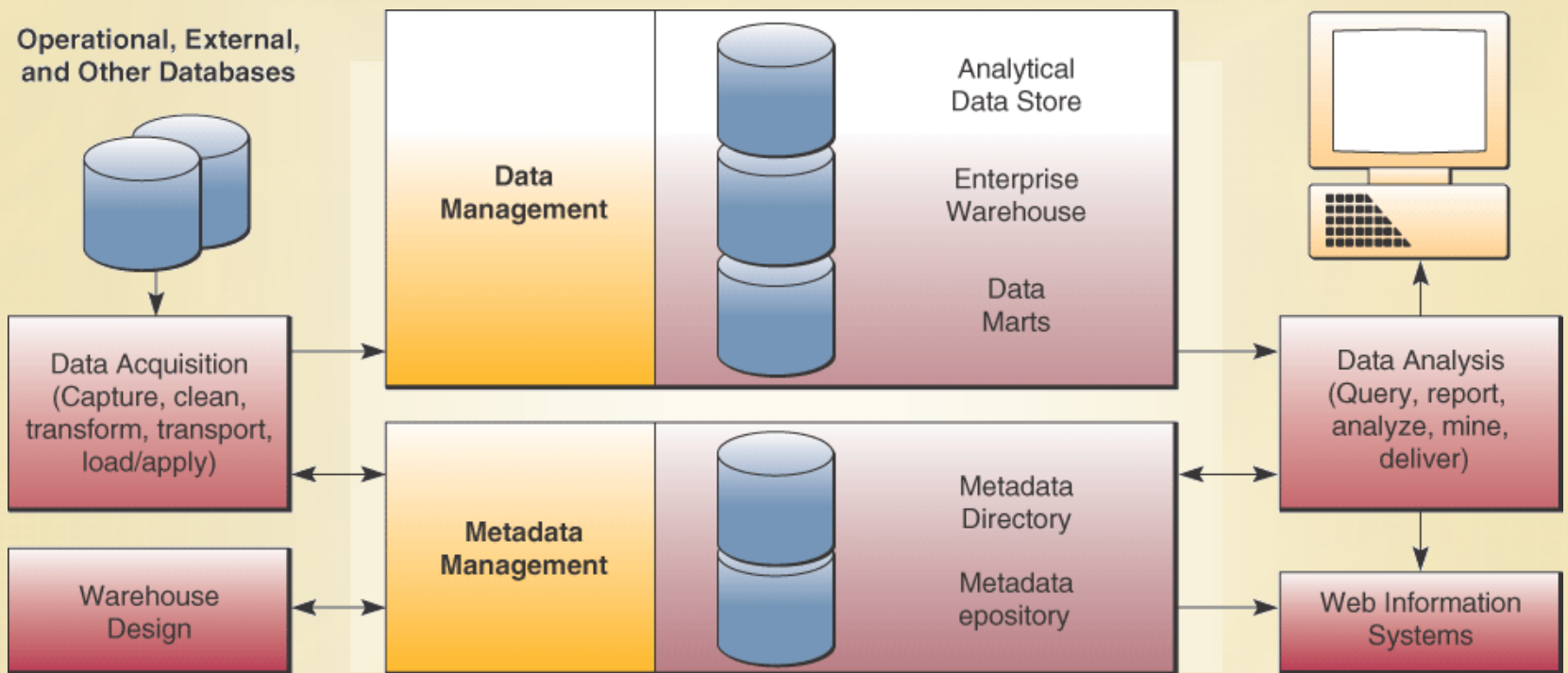
Components of Web-Based System



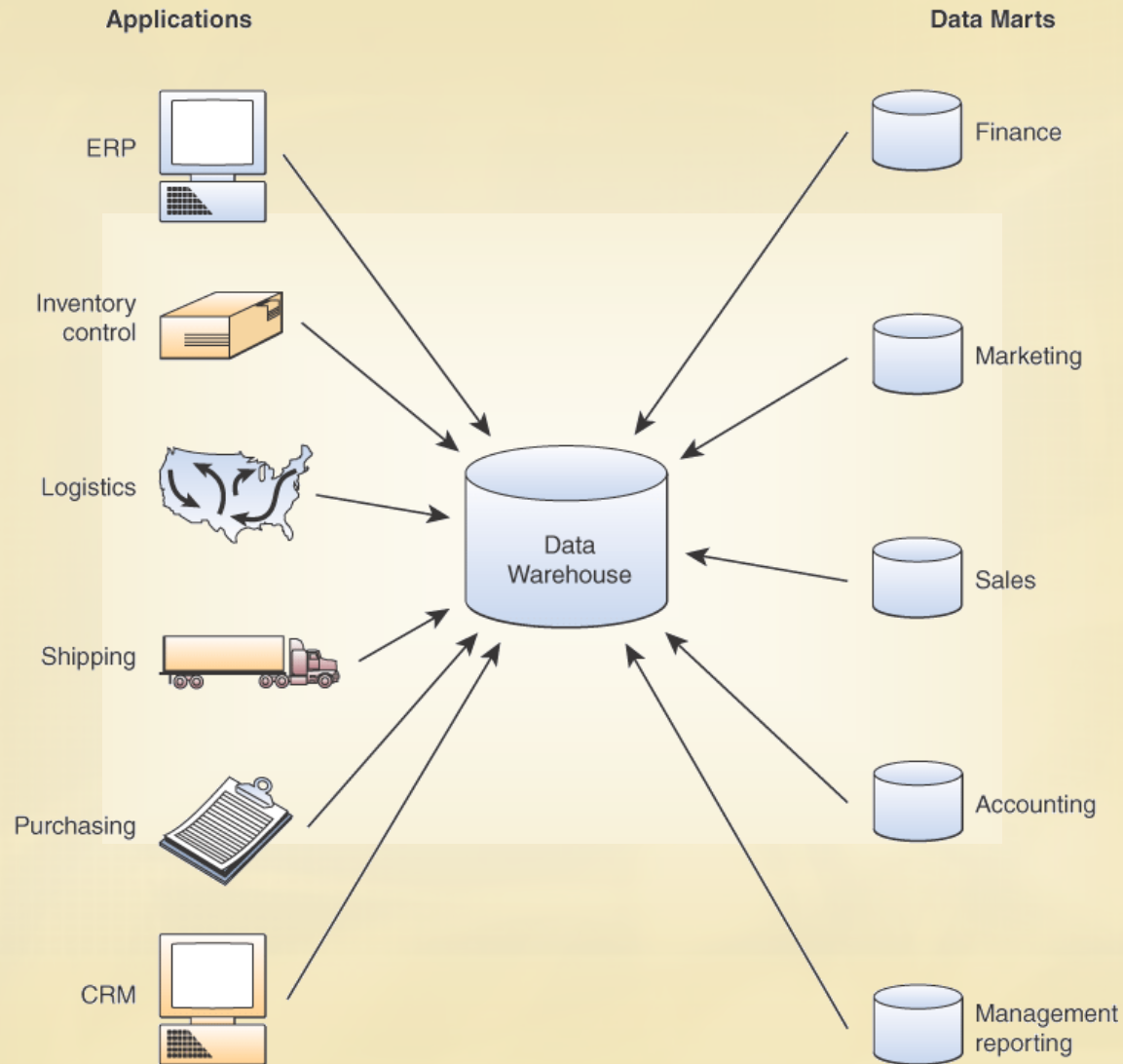
Data Warehouses

- Stores static data that has been extracted from other databases in an organization
 - Central source of data that has been cleaned, transformed, and cataloged
 - Data is used for data mining, analytical processing, analysis, research, decision support
- Data warehouses may be divided into data marts
 - Subsets of data that focus on specific aspects of a company (department or business process)

Data Warehouse Components



Applications and Data Marts



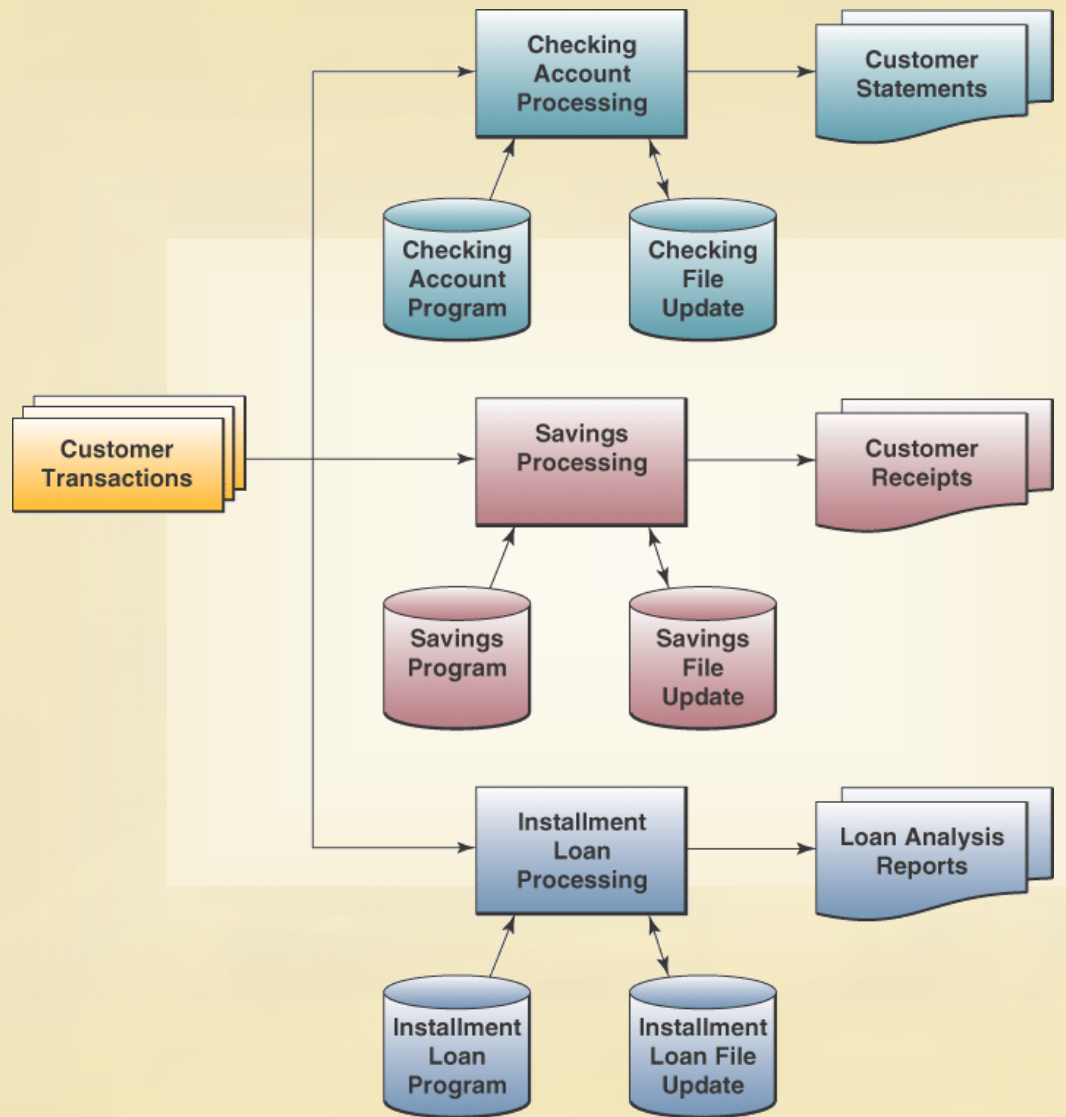
Data Mining

- Data in data warehouses are analyzed to reveal hidden patterns and trends
 - Market-basket analysis to identify new product bundles
 - Find root cause of quality or manufacturing problems
 - Prevent customer attrition
 - Acquire new customers
 - Cross-sell to existing customers
 - Profile customers with more accuracy

Traditional File Processing

- Data are organized, stored, and processed in independent files
 - Each business application designed to use specialized data files containing specific types of data records
- Problems
 - Data redundancy
 - Lack of data integration
 - Data dependence (files, storage devices, software)
 - Lack of data integrity or standardization

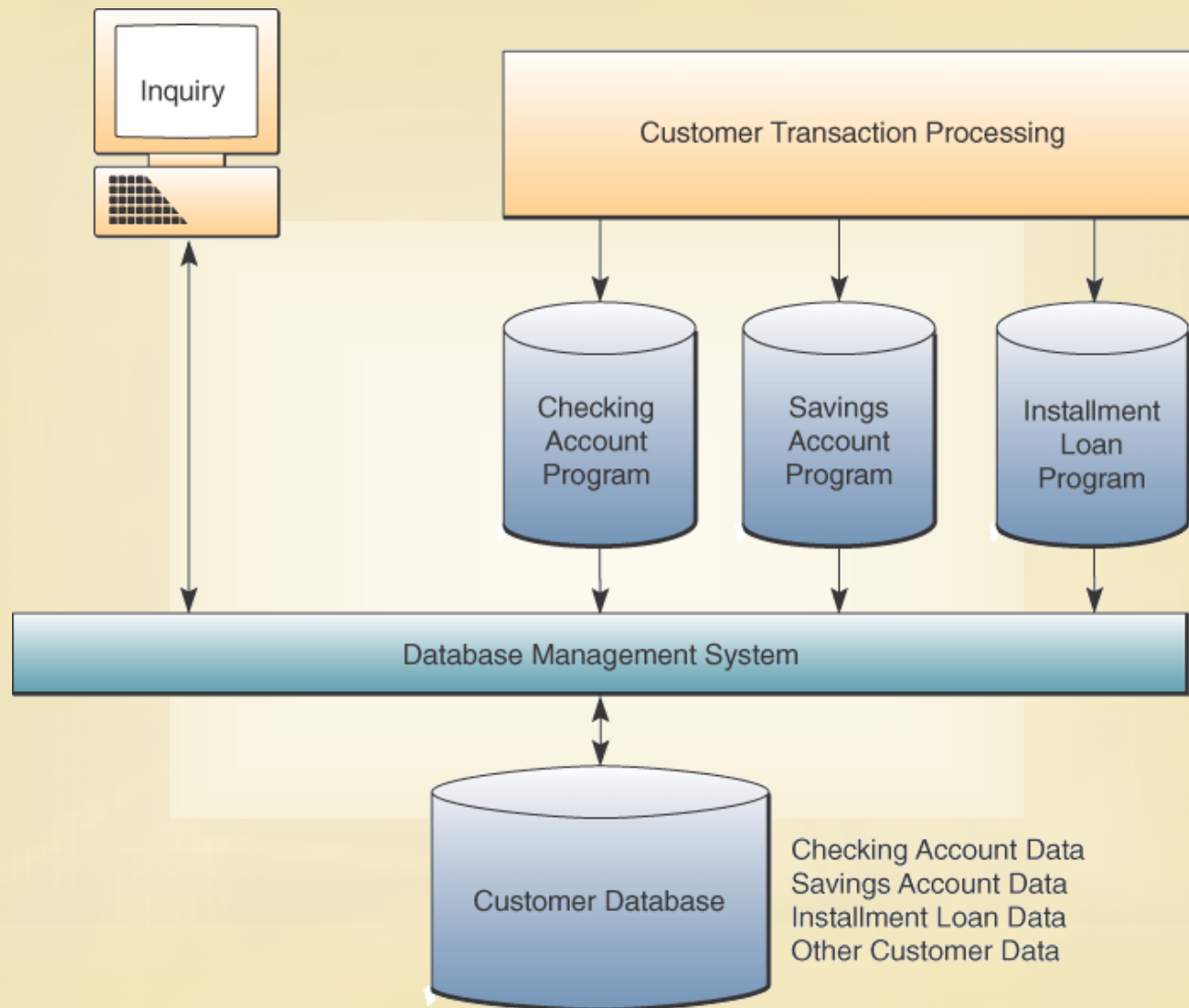
Traditional File Processing



Database Management Approach

- The foundation of modern methods of managing organizational data
 - Consolidates data records formerly in separate files into databases
 - Data can be accessed by many different application programs
 - A database management system (DBMS) is the software interface between users and databases

Database Management Approach



Database Management System

- In mainframe and server computer systems, a software package that is used to...
 - **Create** new databases and database applications
 - **Maintain** the quality of the data in an organization's databases
 - **Use** the databases of an organization to provide the information needed by end users

Common DBMS Software Components

- Database definition
 - Language and graphical tools to define entities, relationships, integrity constraints, and authorization rights
- Nonprocedural access
 - Language and graphical tools to access data without complicated coding
- Application development
 - Graphical tools to develop menus, data entry forms, and reports

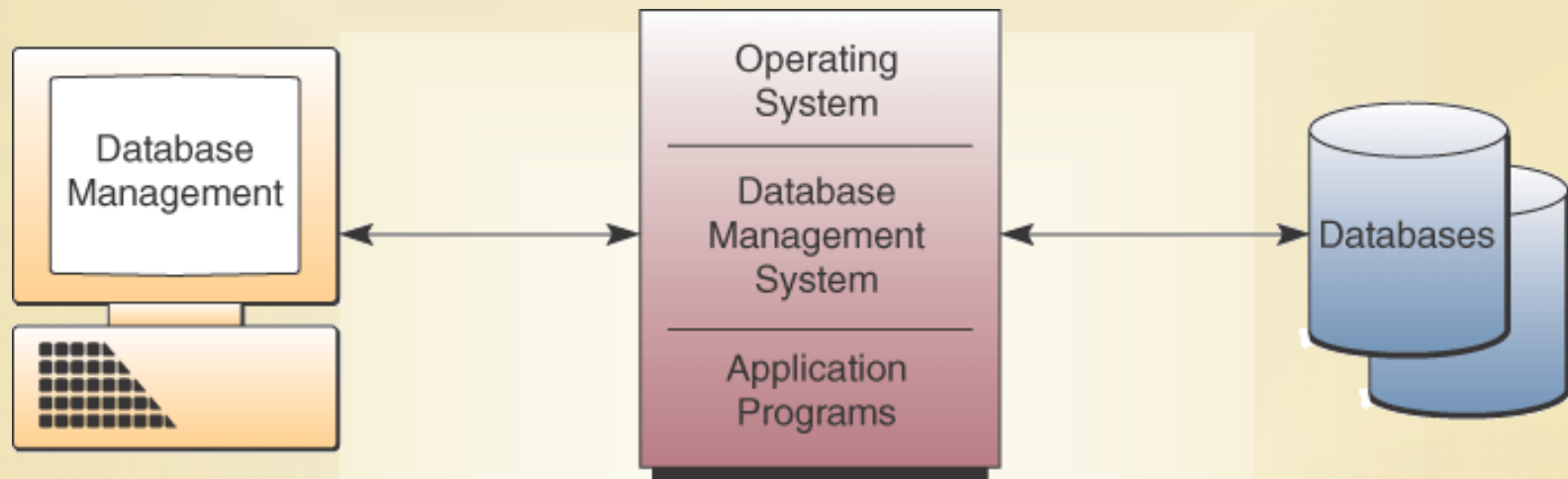
Common DBMS Software Components

- Procedural language interface
 - Language that combines nonprocedural access with full capabilities of a programming language
- Transaction processing
 - Control mechanism prevents interference from simultaneous users and recovers lost data after a failure
- Database tuning
 - Tools to monitor, improve database performance

Database Management System

- Database Development
 - Defining and organizing the content, relationships, and structure of the data needed to build a database
- Database Application Development
 - Using DBMS to create prototypes of queries, forms, reports, Web pages
- Database Maintenance
 - Using transaction processing systems and other tools to add, delete, update, and correct data

DBMS Major Functions



- Create: Database and Application Development
- Maintain: Database Maintenance
- Use: Database Interrogation

Database Interrogation

- End users use a DBMS query feature or report generator
 - Response is video display or printed report
 - No programming is required
- Query language
 - Immediate response to ad hoc data requests
- Report generator
 - Quickly specify a format for information you want to present as a report

Database Interrogation

- SQL Queries
 - Structured, international standard query language found in many DBMS packages
 - Query form is SELECT...FROM...WHERE...

A Sample Natural Language-to-SQL Translation for Microsoft Access

Natural Language

WHAT CUSTOMERS HAD NO ORDERS LAST MONTH?

SQL

```
SELECT [Customers].[Company Name],[Customers].[Contact Name]
FROM [Customers]
WHERE not Exists (SELECT [Ship Name] FROM [Orders]
  WHERE Month {[Order Date]}=1 and Year {[Order Date]}=2004 and
    [Customers].[Customer ID]=[Orders].[Customer ID])
```


Database Interrogation

- Boolean Logic
 - Developed by George Boole in the mid-1800s
 - Used to refine searches to specific information
 - Has three logical operators: AND, OR, NOT
- Example
 - Cats OR felines AND NOT dogs OR Broadway

Database Interrogation

- Graphical and Natural Queries
 - It is difficult to correctly phrase SQL and other database language search queries
 - Most DBMS packages offer easier-to-use, point-and-click methods
 - Translates queries into SQL commands
 - Natural language query statements are similar to conversational English

Graphical Query Wizard

Health Plan Query : Select Query

Employees

- EmployeeID
- Hired
- LastName
- FirstName

Position

- Employee #
- Department
- Title
- HourlyRate

1 — 1

Field:	EmployeeID	LastName	FirstName	Department	Title	HealthPlan
Table:	Employees	Employees	Employees	Position	Position	Position
Sort:		Ascending	Ascending			
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Criteria:						Yes
or:						

Database Maintenance

- Accomplished by transaction processing systems and other applications, with the support of the DBMS
 - Done to reflect new business transactions and other events
 - Updating and correcting data, such as customer addresses

Application Development

- Use DBMS software development tools to develop custom application programs
 - Not necessary to develop detailed data-handling procedures using conventional programming languages
 - Can include data manipulation language (DML) statements that call on the DBMS to perform necessary data handling

Assesment

- Buat Makalah (Kajian) Tentang :
 - Distributed Databases
 - Hypermedia Databases
 - Sistem Datawarehouse
 - Data Mining
 - Web Mining
- Makalah (Tercetak dikumpulkan) Online
(Upload ke Kuliah Online Makalah + Slide)
- Presentasi Minggu Depan (Slide Maks 15 hal)
- Makalah berupa kajian dari berbagai sumber.
- Referensi disertakan.

End Of Chapter

Thank U

