

DATABASE 2

Database

O'Brien & Marakas

Untuk dapat mengkaji lebih jauh tentang database, berikut ini akan dipaparkan materi tentang database yang dikemukakan oleh James A. O'Brien dan George M. Marakas dalam bukunya "Management Information Systems", chapter 5, sebagai berikut:

Why Study Data Resource Management?

- Today's business enterprises cannot survive or succeed without quality data about their internal operations and external environment.

Data Resource Management

Definition:

- A managerial activity that applies information systems technologies to the task of managing an organization's data resources to meet the information needs of their business stakeholders

Case #1: Data Warehouse Challenges

Goal:

- Bring all customer data together to enhance management's view of operations
- Potentially help strengthen customer relationships

Case #1: Data Warehouse Challenges

Planning:

- Consistent definitions for all data types
- Centralized or decentralized architecture
- Data warehouse foundation must be expandable to meet growing data streams and information demands

Case #1: Data Warehouse Challenges

1. What is the business value of a data warehouse? Use Argosy Gaming as an example.
2. Why did Argosy use an ETL software tool? What benefits and problems arose? How were they solved?

Case #1: Data Warehouse Challenges

3. What are some of the major responsibilities that business professionals and managers have in data warehouse development? Use Argosy Gaming as an example.
4. Why do analysts, users, and vendors say that the benefits of data warehouses depend on whether companies “know their data resources and what they want to achieve with them?” Use Argosy Gaming as an example.

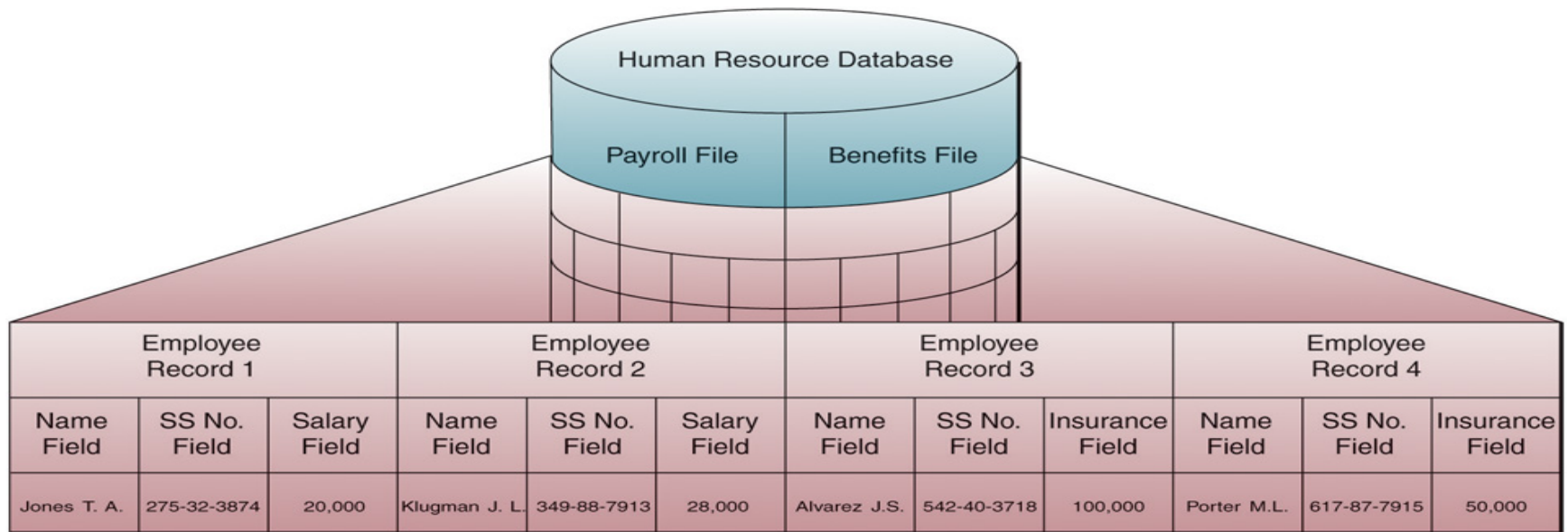
Foundation Data Concepts

- **Character** – single alphabetic, numeric or other symbol
- **Field** – group of related characters
- **Entity** – person, place, object or event
- **Attribute** – characteristic of an entity

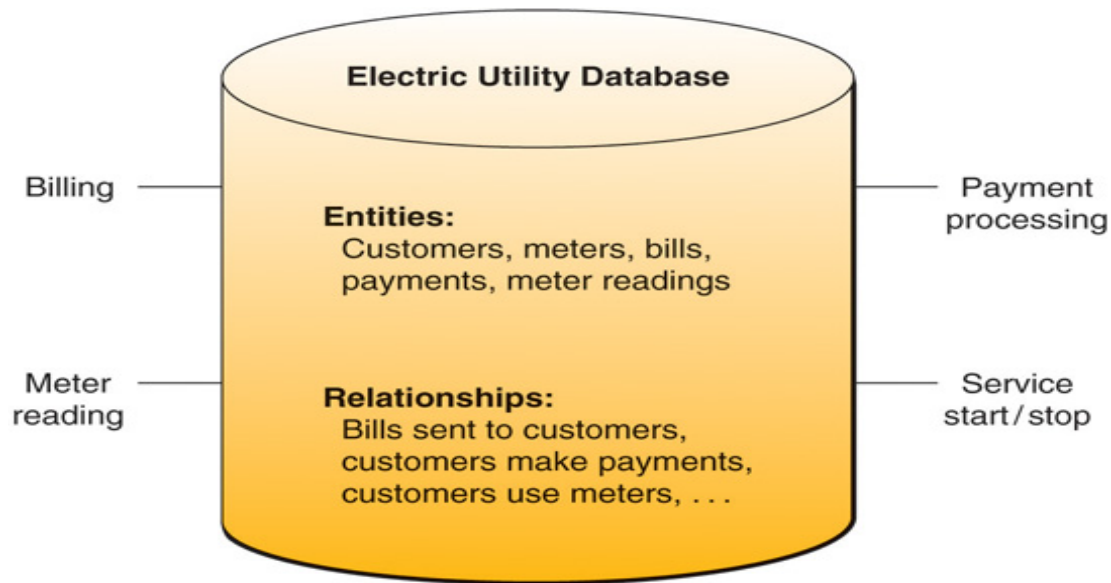
Foundation Data Concepts

- **Record** – collection of attributes that describe an entity
- **File** – group of related records
- **Database** – integrated collection of logically related data elements

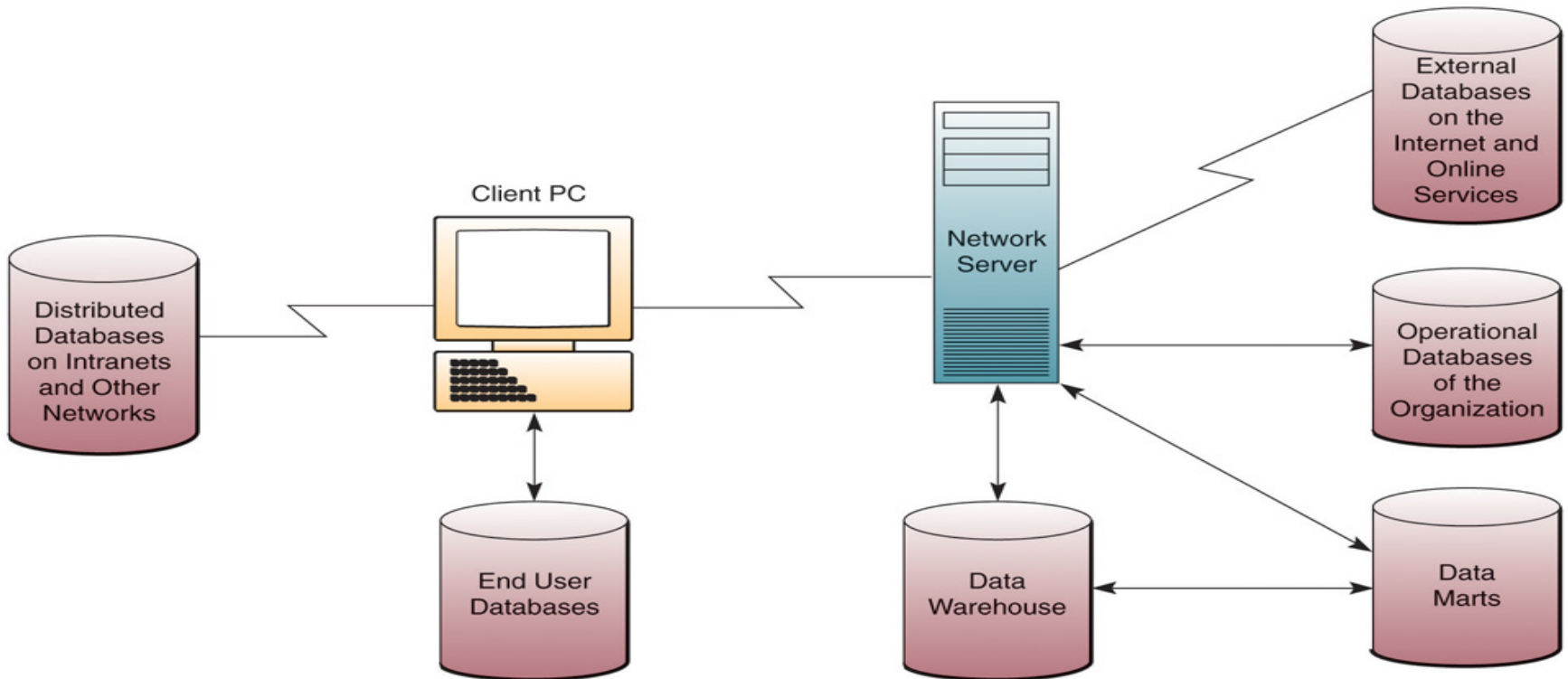
Logical Data Elements



Entities and Relationships



Types of Databases



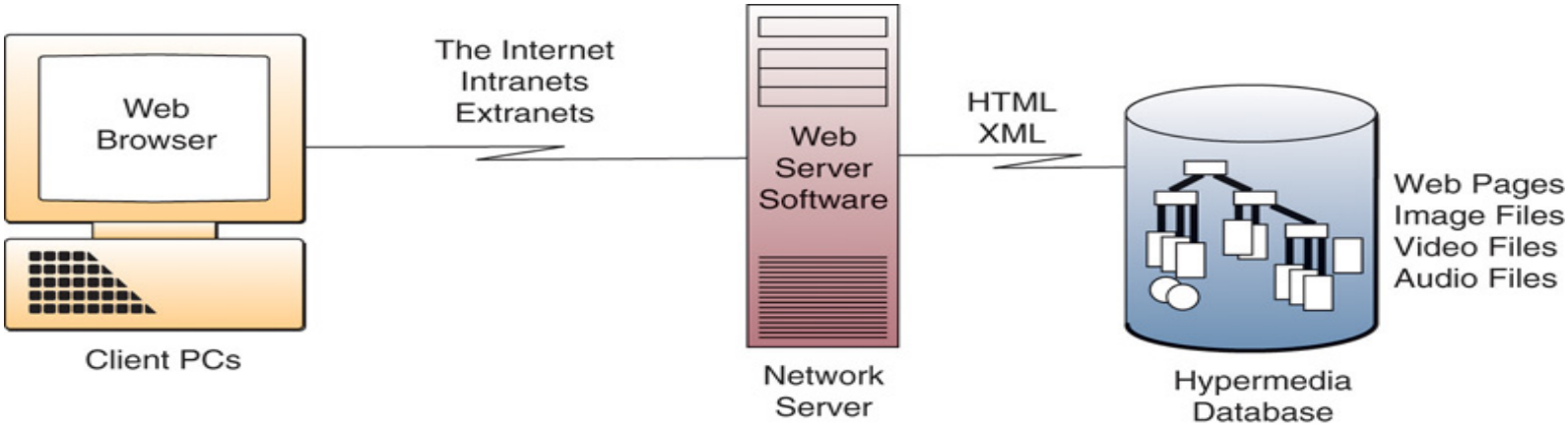
Types of Databases

- **Operational** – store detailed data needed to support the business processes and operations of a company
- **Distributed** – databases that are replicated and distributed in whole or in part to network servers at a variety of sites

Types of Databases

- **External** – contain a wealth of information available from commercial online services and from many sources on the World Wide Web
- **Hypermedia** – consist of hyperlinked pages of multimedia

Hypermedia Database

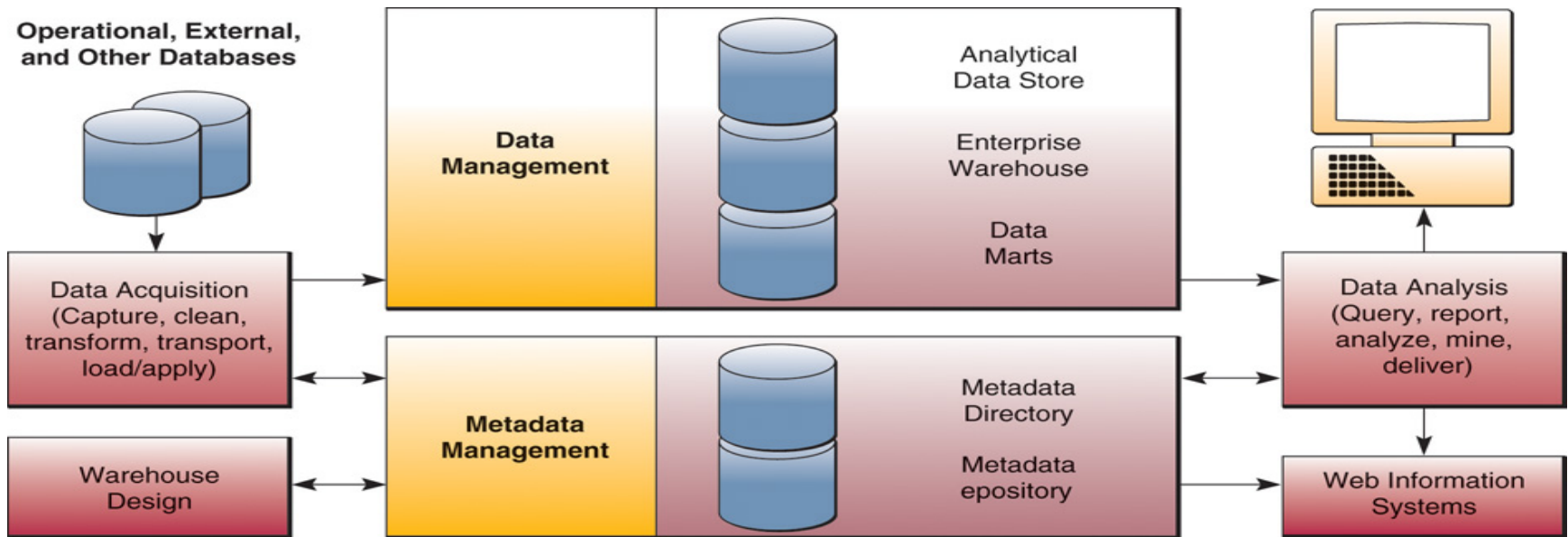


Data Warehouse

Definition:

- Large database that stores data that have been extracted from the various operational, external, and other databases of an organization

Data Warehouse System

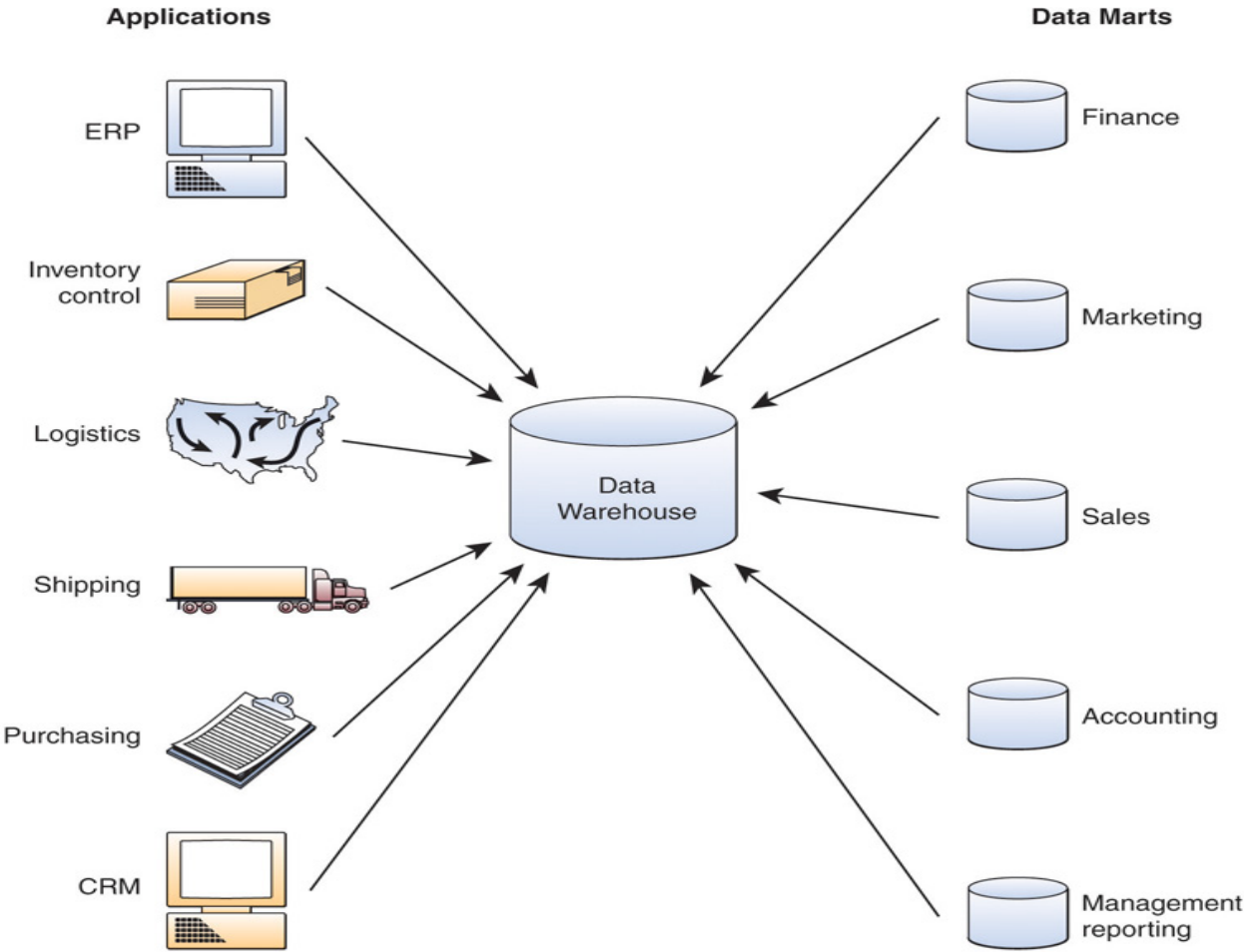


Data Mart

Definition:

- Databases that hold subsets of data from a data warehouse that focus on specific aspects of a company, such as a department or a business process

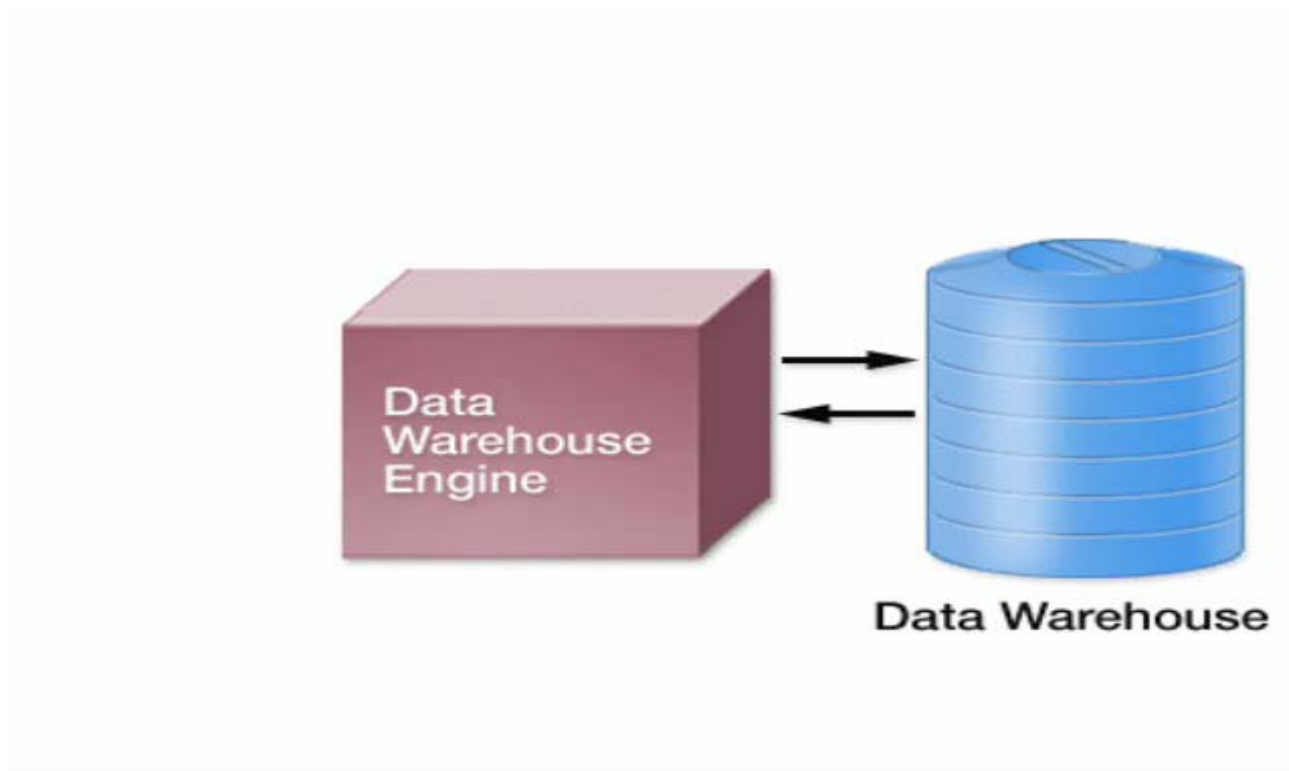
Data Warehouse & Data Marts



Data Warehouse & Data Marts



Retrieving Information from Data Warehouse

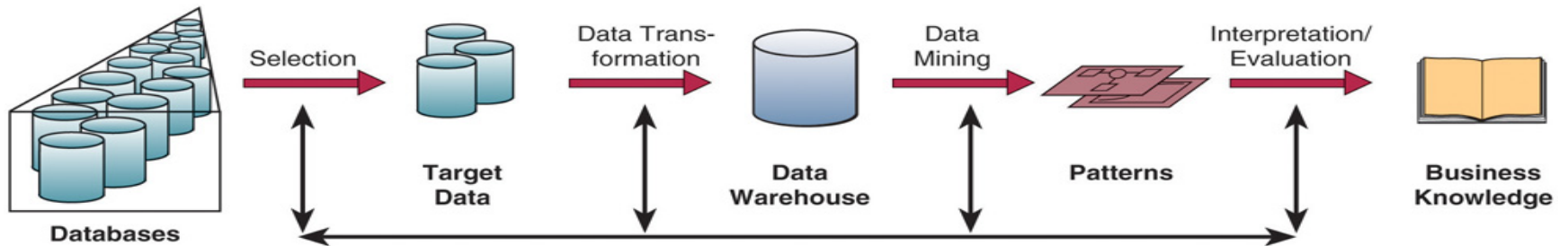


Data Mining

Definition:

- Analyzing the data in a data warehouse to reveal hidden patterns and trends in historical business activity

Data Mining



Data Mining Uses

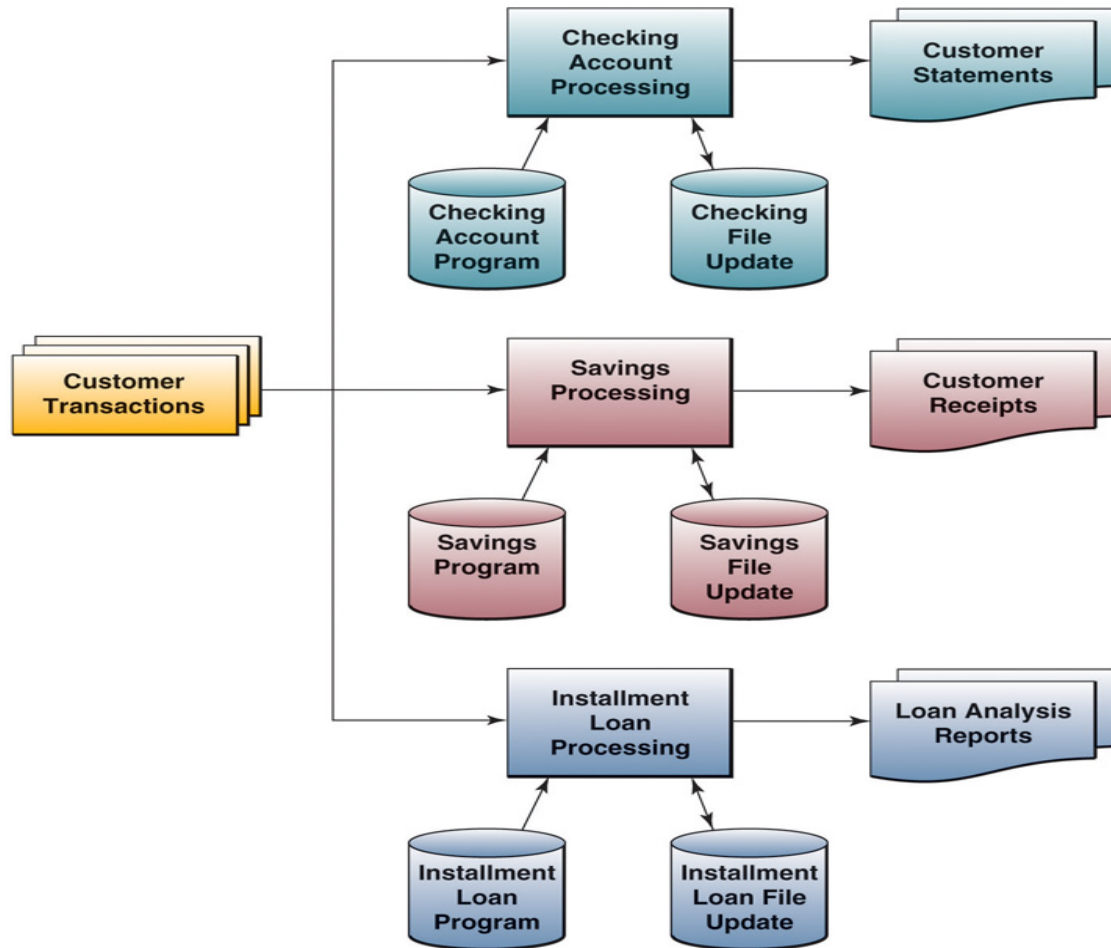
- Perform “market-basket analysis” to identify new product bundles.
- Find root causes to quality or manufacturing problems.
- Prevent customer attrition and acquire new customers.
- Cross-sell to existing customers.
- Profile customers with more accuracy.

Traditional File Processing

Definition:

- Data are organized, stored, and processed in independent files of data records

File Processing Systems



Problems of File Processing

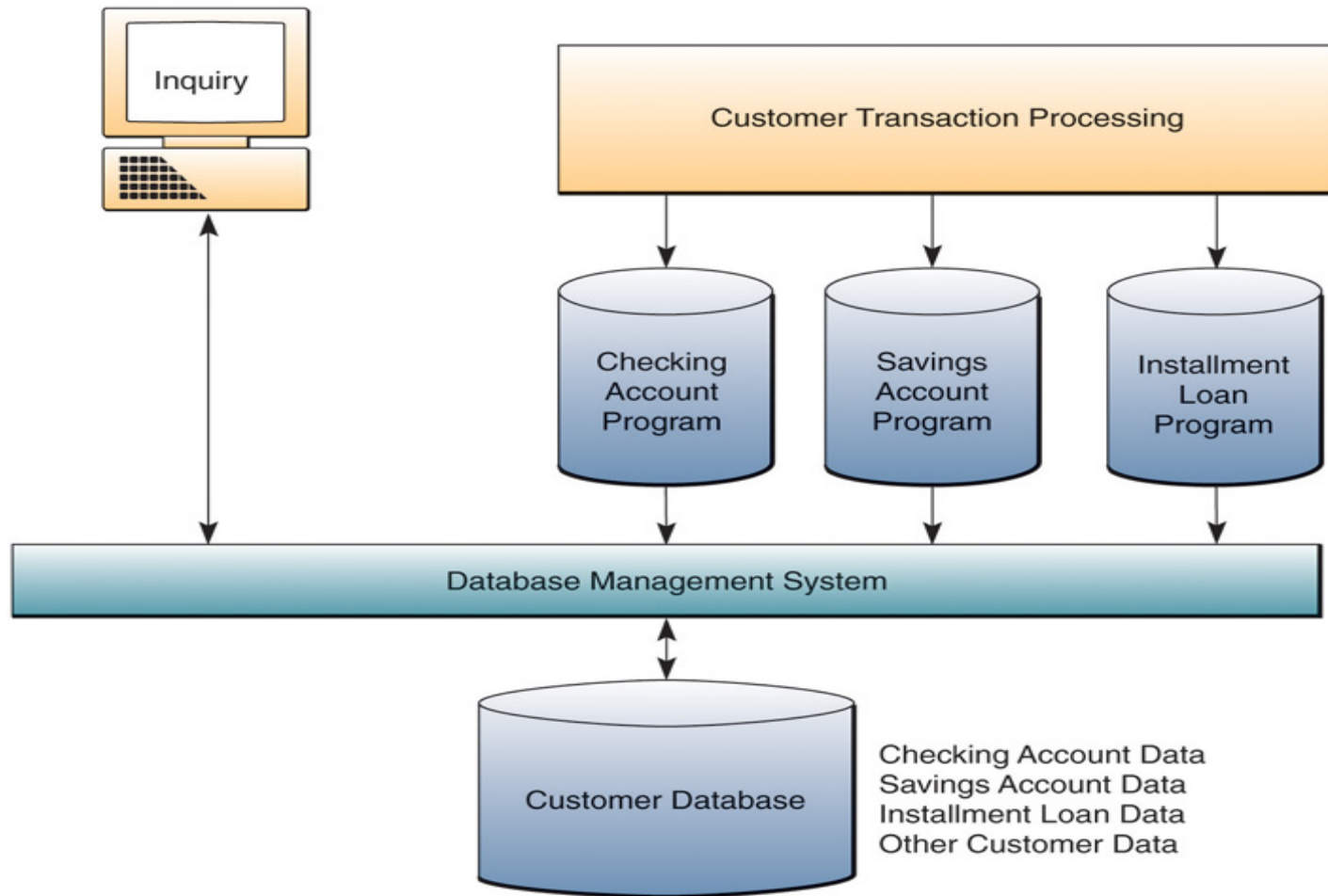
- **Data Redundancy** – duplicate data requires an update to be made to all files storing that data
- **Lack of Data Integration** – data stored in separate files require special programs for output making ad hoc reporting difficult
- **Data Dependence** – programs must include information about how the data is stored so a change in storage format requires a change in programs

Database Management Approach

Definition:

- Consolidates data records into one database that can be accessed by many different application programs.
- Software interface between users and databases
- Data definition is stored once, separately from application programs

Database Management Approach



Database Management Software (DBMS)

Definition:

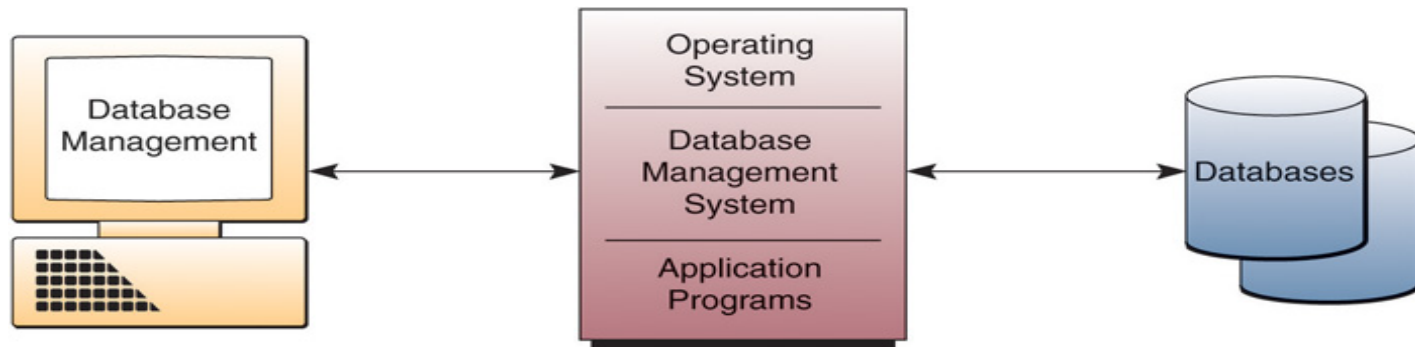
- Software that controls the creation, maintenance, and use of databases

DBMS Software Components

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

Uses of DBMS Software



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

Database Interrogation

Definition:

- Capability of a DBMS to report information from the database in response to end users' requests
- **Query Language** – allows easy, immediate access to ad hoc data requests
- **Report Generator** - allows quick, easy specification of a report format for information users have requested

Database Query vs. Report



Natural Language vs. SQL Queries

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 Maintenance

- Updating a database continually to reflect new business transactions and other events
- Updating a database to correct data and ensure accuracy of the data

Application Development

- End users, systems analysts, and other application developers can use the internal 4GL programming language and built-in software development tools provided by many DBMS packages to develop custom application programs.

Case #2: Protecting the Data Jewels

- In the casino industry, one of the most valuable assets is the dossier that casinos keep on their affluent customers.
- While savvy companies are using business intelligence and CRM systems to identify their most profitable customers, there's a genuine danger of that information falling into the wrong hands.
- Broader access to those applications and the trend toward employees switching jobs more frequently have made protecting customer lists an even greater priority.

Case #2: Protecting the Data Jewels

Prevention:

- Employees with access to such information should be required to sign nondisclosure, non-compete, and non-solicitation agreements regarding customer lists.
- Treat customer lists as confidential information internally. Limit access to customer lists to only those employees who need them.
- Enforce strong physical security policies.
- Scan e-mail for proprietary information.
- Establish and review audit trails.

Case #2: Protecting the Data Jewels

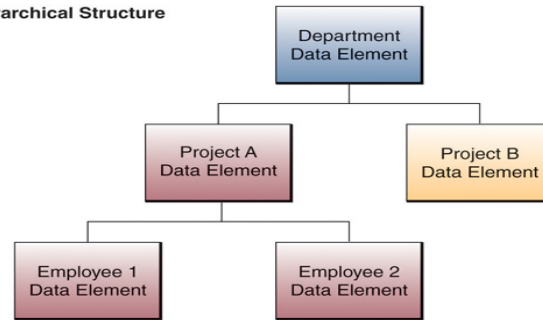
1. Why have developments in IT helped to increase the value of the data resources of many companies?
2. How have these capabilities increased the security challenges associated with protecting a company's data resources?
3. How can companies use IT to meet the challenges of data resource security?

Case #2: Protecting the Data Jewels

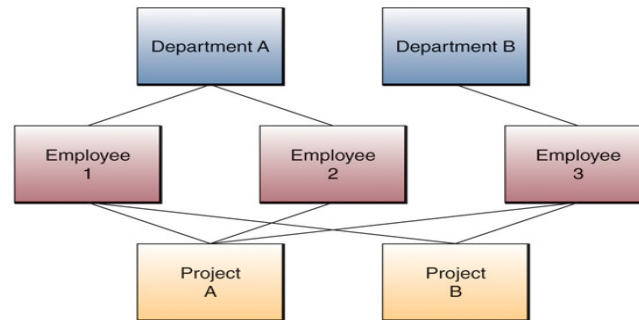
4. What are several major threats today to the security of the data resources of a company and its business partners? Explain several ways a company could protect their data resources from the threats you identify.

Fundamental Database Structures

Hierarchical Structure



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

Database Structures

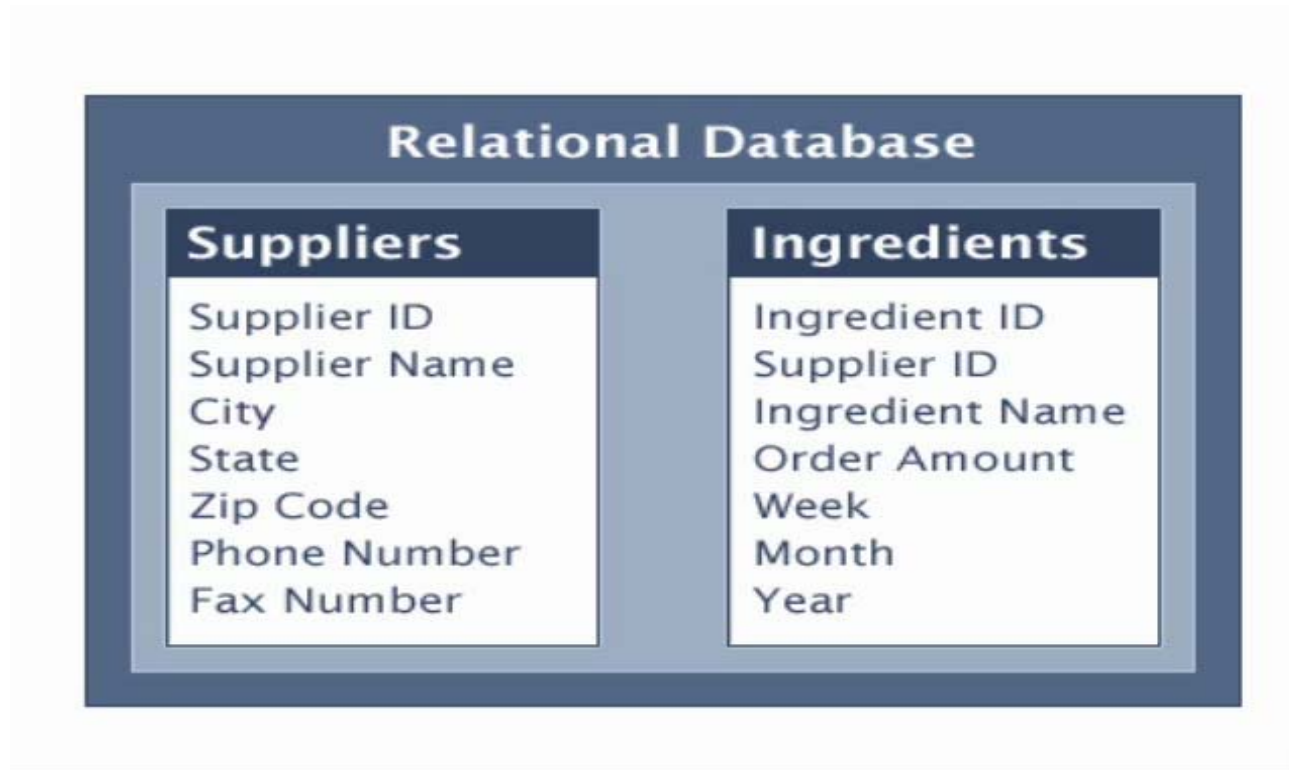
- **Hierarchical** – relationships between records form a hierarchy or treelike structure
- **Network** – data can be accessed by one of several paths because any data element or record can be related to any number of other data elements

Relational Database Structure

Definition:

- All data elements within the database are viewed as being stored in the form of simple tables

Relational Database



Multidimensional Database Structure

Definition:

- Variation of the relational model that uses multidimensional structures to organize data and express the relationships between data

Multidimensional Database Structure

East		February		March	
		Actual	Budget	Actual	Budget
Sales	Camera				
	TV				
	VCR				
	Audio				
Margin	Camera				
	TV				
	VCR				
	Audio				

Sales		East		West	
		Actual	Budget	Actual	Budget
TV	January				
	February				
	March				
	Qtr 1				
VCR	January				
	February				
	March				
	Qtr 1				

January		Actual		Budget	
		Sales	Margin	Sales	Margin
TV	East				
	West				
	South				
	Total				
VCR	East				
	West				
	South				
	Total				

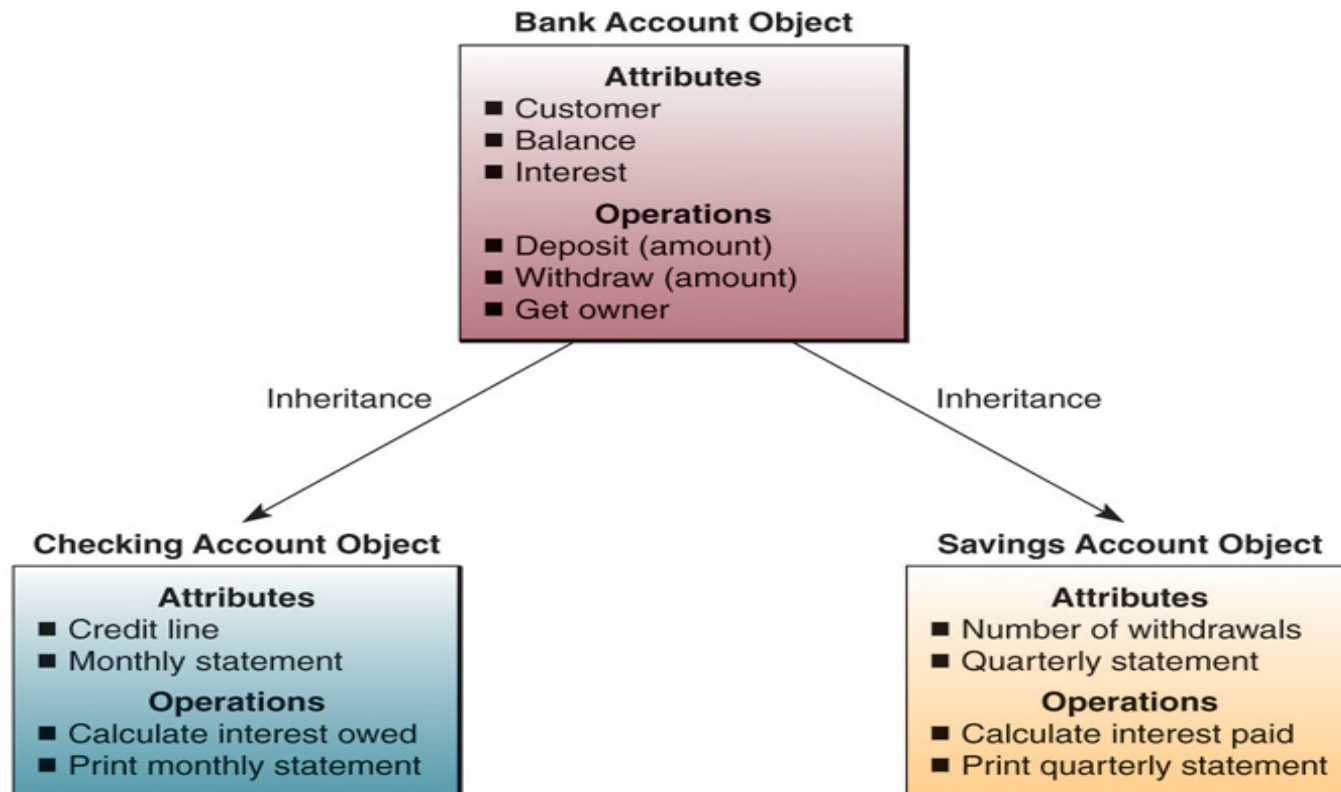
January		Sales		Margin	
		TV	VCR	TV	VCR
East	Actual				
	Budget				
	Forecast				
	Variance				
West	Actual				
	Budget				
	Forecast				
	Variance				

Object-Oriented Database Structure

Definition:

- Can accommodate more complex data types including graphics, pictures, voice and text
- **Encapsulation** – data values and operations that can be performed on them are stored as a unit
- **Inheritance** – automatically creating new objects by replicating some or all of the characteristics of one or more existing objects

Inheritance



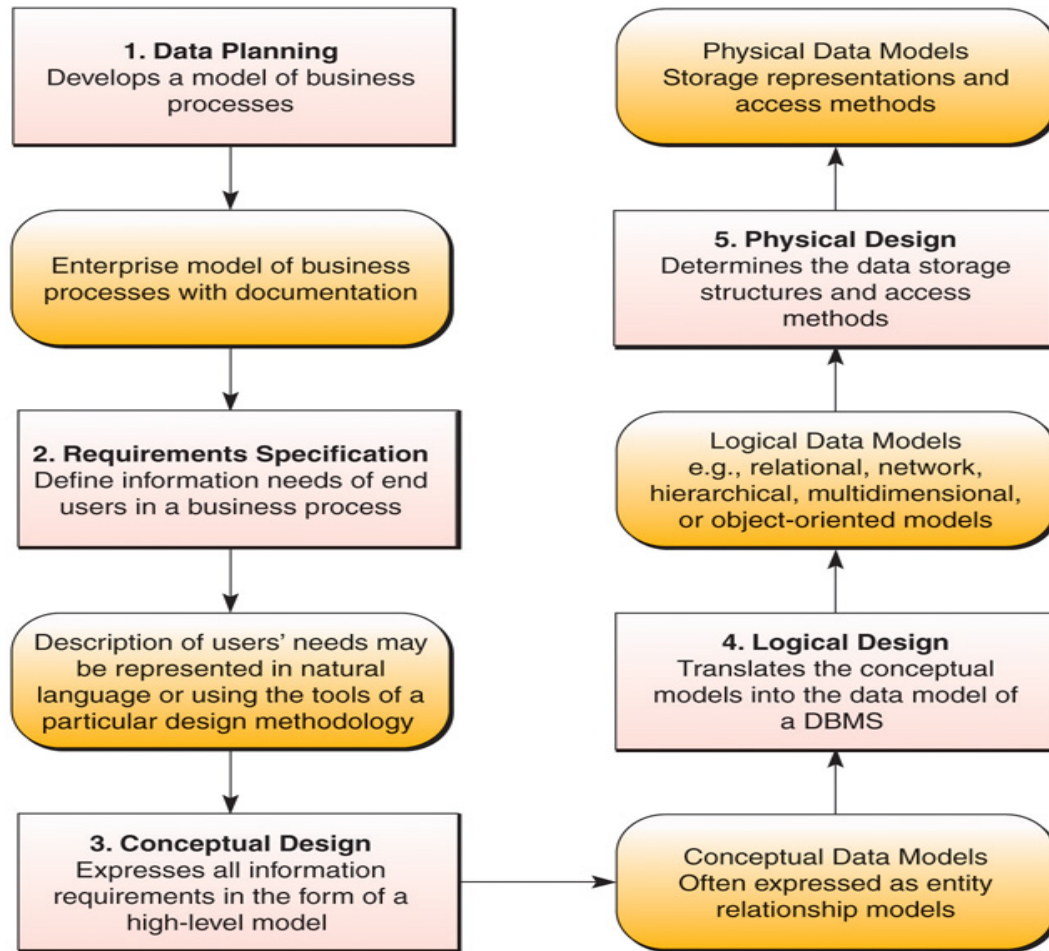
Evaluation of Database Structures

- Hierarchical data structure is best for structured, routine types of transaction processing.
- Network data structure is best when many-to-many relationships are needed.
- Relational data structure is best when ad hoc reporting is required.

Database Development

- Enterprise-wide database development is usually controlled by database administrators (DBA)
- **Data dictionary** – catalog or directory containing metadata
- **Metadata** – data about data

Database Development Process



Data Planning

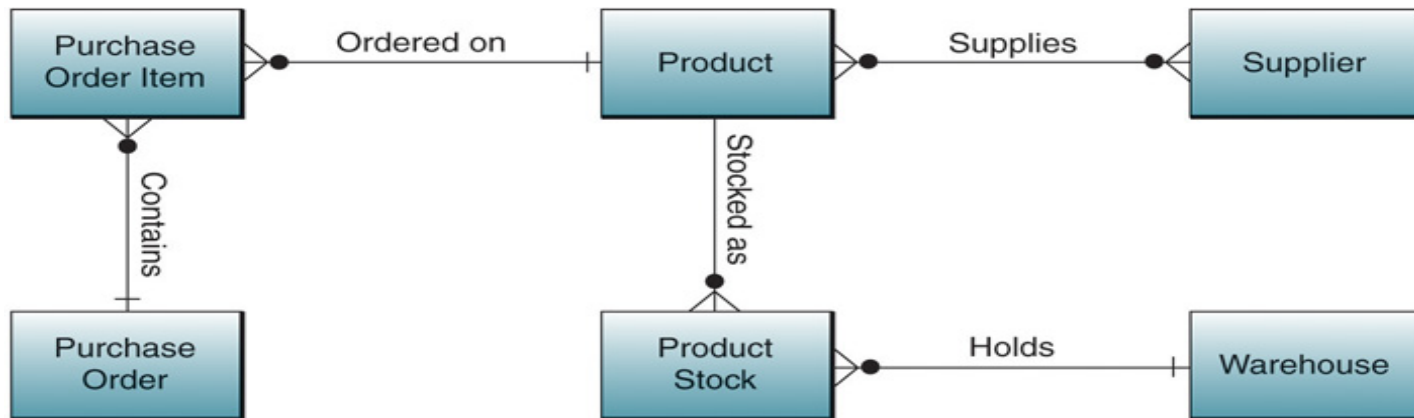
- Database administrators and designers work with corporate and end user management to develop an enterprise model that defines the basic business process of the enterprise.

Data Modeling

Definition:

- Process where the relationships between data elements are identified

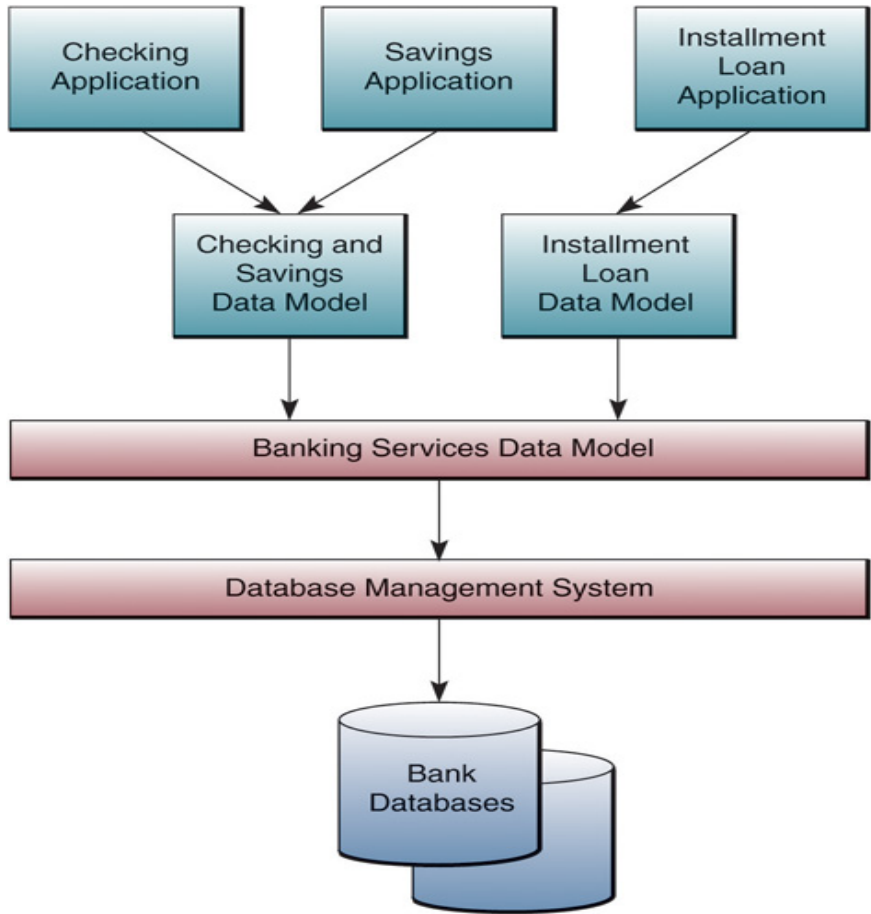
Entity Relationship Diagram



Logical vs. Physical Views

- **Logical** – data elements and relationships among them
- **Physical** – describes how data are to be stored and accessed on the storage devices of a computer system

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

Case #3: Data Warehouse Business Value

IT Challenge:

- How to integrate and massage reams of data so that business units can respond immediately to changes in sales and customer preferences

Case #3: Data Warehouse Business Value

Solution:

- A data warehouse
- Hire people with data warehousing skills
- Ensure data quality by:
 - Cleansing data from TPS
 - Establishing standardized transaction codes
 - Interviewing end users about quality of current data and future information needs

Case #3: Data Warehouse Business Value

1. What are some of the key requirements for building a good data warehouse? Use Henry Schein Inc. as an example.
2. What are the key software tools needed to construct and use a data warehouse?
3. What is the business value of a data warehouse to Henry Schein? To any company?

Case #4: Data Stewards

Data Stewards

- Department of employees dedicated to establishing and maintaining the quality of data entered into the operational systems that feed the data warehouse
- Research customer relationship, locations, and corporate hierarchies
- Train overseas workers to fix data in their native languages

Case #4: Data Stewards

Data Steward Skills

- Technical knowledge to use tools necessary to analyze and fix data
- Business Knowledge needed to make judgment calls about what's wrong with the data and how to fix it
- Politically astute, diplomatic and good at conflict resolution
- Understand that data quality is a journey, not a destination. One-hundred percent accuracy is just not achievable.

Case #4: Data Stewards

1. Why is the role of a data steward considered to be innovative? Explain.
2. What are the business benefits associated with the data steward program at Emerson?
3. How does effective data resource management contribute to the strategic goals of an organization? Provide examples from Emerson and others.

Summary

- Data resource management is a managerial activity that applies information technology and software tools to the task of managing an organization's data resources.
- The database management approach consolidates data needed by different applications into several common databases and provides an easy-to-use ad hoc reporting capability.

Summary

- Database management systems are software packages that simplify the creation, use, and maintenance of databases.
- Several types of databases are used by business organizations including operational, distributed, and external databases.
- Data warehouses are a central source of data from other databases that have been cleaned, transformed, and cataloged for business analysis and decision support applications.

Summary

- Data must be organized in some logical manner on physical storage devices so that they can be efficiently processed. For this reason, data are commonly organized into logical data elements such as characters, fields, records, files and databases.
- Database structures such as the hierarchical, network, relational, and object-oriented models are used to organize the relationships among the data records stored in databases.

Summary

- The development of databases can be easily accomplished using microcomputer database management packages for small end-user applications.