Chapter 11
Information and Data Management

Objectives Overview

Define the term, database, and explain how a database interacts with data and information

Define the term, data integrity, and describe the qualities of valuable information

Discuss the terms character, field, record, and file

Describe file maintenance techniques and validation techniques

Differentiate between the file processing approach and the database approach

See Page 464 for Detailed Objectives

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Objectives Overview

Discuss the functions common to most database management systems

Describe characteristics of relational, object-oriented, and multidimensional databases

Discuss web databases

Identify database design guidelines and understand the responsibilities of database analysts and administrators

Describe various information systems used in an enterprise

Databases, Data, and Information

Database
- Collection of data organized in a manner that allows access, retrieval, and use of that data

Data
- Collection of unprocessed items
  - Text
  - Numbers
  - Images
  - Audio
  - Video

Information
- Processed data
  - Organized
  - Meaningful
  - Useful
• **Database software**, often called a **database management system (DBMS)**, allows users to:

  - Create a computerized database
  - Add, modify, and delete data
  - Sort and retrieve data
  - Create forms and reports from the data
Databases, Data, and Information

• Data integrity reflects the quality of the data
  – The more errors the data contains, the lower its integrity
  – Data integrity is important because computers and people use information to make decisions and take actions

• Valuable information should have the following characteristics:
  - Accurate
  - Verifiable
  - Timely
  - Organized
  - Accessible
  - Useful
  - Cost-effective
Databases, Data, and Information

- Data is organized in layers
  - Files, records, fields, characters

A character is one byte
  - Numbers, letters, space, punctuation marks, or other symbols

A field is a combination of one or more related characters
  - Field name
  - Field size
  - Data type
• Common data types include:

- Text
- Number
- AutoNumber
- Currency
- Date
- Memo
- Yes/No
- Hyperlink
- Object
- Attachment

- A record is a group of related fields
  - A primary key is a field that uniquely identifies each record

- A data file is a collection of related records
**Databases, Data, and Information**

- **File maintenance** refers to the procedures that keep data current

![Adding records](Adding_records.png)

![Modifying records](Modifying_records.png)

![Deleting records](Deleting_records.png)

- Users add new records to a file when they obtain new data

![Figure 11-5](Figure_11-5.png)
Databases, Data, and Information

• Users generally modify a record to correct inaccurate data or update old data

Databases, Data, and Information

• When a record no longer is needed, a user deletes it from a file
Databases, Data, and Information

**Validation** compares data with a set of rules or values to find out if the data is correct.

- Alphabetic/Numeric check
- Range check
- Consistency check
- Completeness check
- Check digit
- Other checks

File Processing Versus Databases

<table>
<thead>
<tr>
<th>File processing system</th>
<th>Database approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each department has its own set of files</td>
<td>Programs and users share data</td>
</tr>
<tr>
<td>Have data redundancy</td>
<td>Reduced data redundancy</td>
</tr>
<tr>
<td>Isolate data</td>
<td>Improved data integrity</td>
</tr>
</tbody>
</table>

- Shared data
- Easier access
- Reduced development time
File Processing Versus Databases

Database Management Systems

- A data dictionary contains data about each file in the database and each field in those files
Database Management Systems

• A DBMS provides several tools that allow users and programs to retrieve and maintain data in the database

  - Query language
  - Query by example
  - Form
  - Report writer

A query language consists of simple, English-like statements that allow users to specify the data to display, print, store, update, or delete.

- Structured Query Language (SQL) is a popular query language that allows users to manage, update, and retrieve data.
- Many DBMSs provide tools to guide nontechnical users through the steps of creating a query.
Most DBMSs include query by example (QBE), a feature that has a graphical user interface to assist users with retrieving data.
Database Management Systems

• A **form** is a window on the screen that provides areas for entering or modifying data in a database.

• A **report writer** allows users to design a report on the screen, retrieve data into the report design, and then display or print the report.

A DBMS provides means to ensure that only authorized users access data:

- **Access privileges**
- **Principle of least privilege policy**
Database Management Systems

• A DMBS provides a variety of techniques to restore the database to a usable form in case it is damaged or destroyed.

  - Backup
  - Log
  - Recovery utility
  - Continuous backup

Relational, Object-Oriented, and Multidimensional Databases

• A data model defines how users view the organization of the data.

**Table 11-2 Data Terminology Comparison**

<table>
<thead>
<tr>
<th>File Processing Environment</th>
<th>Relational Database Developer</th>
<th>Relational Database User</th>
</tr>
</thead>
<tbody>
<tr>
<td>File</td>
<td>Relation</td>
<td>Table</td>
</tr>
<tr>
<td>Record</td>
<td>Tuple</td>
<td>Row</td>
</tr>
<tr>
<td>Field</td>
<td>Attribute</td>
<td>Column</td>
</tr>
</tbody>
</table>
Relational, Object-Oriented, and Multidimensional Databases

• A **relational database** stores data in **tables** that consist of rows and columns
  – Each **row** has a primary key
  – Each **column** has a unique name
• A **relationship** is a link within the data

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Relational, Object-Oriented, and Multidimensional Databases

• An **object-oriented database (OODB)** stores data in **objects**
• Examples of applications appropriate for an object-oriented database include:
  - **Media database**
  - **Groupware database**
  - **CAD database**
Relational, Object-Oriented, and Multidimensional Databases

- A multidimensional database can store data in more than two dimensions of data
  - Sometimes known as a hypercube
  - Can consolidate data much faster than a relational database
- A data warehouse is a huge database that stores and manages the data required to analyze historical and current transactions

Web Databases

- The web offers information about:
  - Jobs
  - Travel
  - Destinations
  - Television programming
  - Photos
  - Movies
  - Videos
  - Local and national weather
  - Sporting events
  - Legislative information
Database Administration

Database analysts and administrators are responsible for managing and coordinating all database activities.

<table>
<thead>
<tr>
<th>Database Analyst (DA)</th>
<th>Database Administrator (DBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decides on proper placement of fields, defines data relationship, and identifies users’ access privileges</td>
<td>Creates and maintains the data dictionary, manages security of the database, monitors the performance of the database, and checks backup and recovery procedures</td>
</tr>
</tbody>
</table>

Information Systems in the Enterprise

• An information system is a set of hardware, software, data, people, and procedures that work together to produce information.

Table 11-3: Information Systems Used Exclusively by Functional Units in an Enterprise

<table>
<thead>
<tr>
<th>Functional Unit</th>
<th>Information System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Resources (HR)</td>
<td>Human resources information system (HRIS) manages one or more administrative human resources functions, such as maintaining and managing employee benefits, schedules, and payroll.</td>
</tr>
<tr>
<td>Engineering or Product Development</td>
<td>Computer-aided engineering (CAE) aids in the development and testing of product designs, and often includes CAD (computer-aided design).</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Computer-aided manufacturing (CAM) controls production equipment, such as CNC, robots, and millng machines. National Requirements Planning (NRP): monitors and controls inventory, materials purchases, and other processes related to manufacturing operations. Manufacturing Resource Planning II (MRPII) is an enhancement of MRP that also includes product architecture and design, machine scheduling, financial planning, demand forecasting, tracking labor productivity, and monitoring product quality.</td>
</tr>
<tr>
<td>Marketing</td>
<td>Market research systems analyze data gathered from demographics and surveys.</td>
</tr>
<tr>
<td>Sales</td>
<td>Salesforce automation (SFA) helps salespeople manage customer contacts, schedule customer meetings, log customer interactions, manage product information, and place customer orders.</td>
</tr>
<tr>
<td>Customer Service</td>
<td>Customer relationship management (CRM) manages information about customers, past purchases, interests, and the like to develop relationships, such as phone calls, email messages, web communications, and instant messaging sessions.</td>
</tr>
</tbody>
</table>
Information Systems in the Enterprise

- **Enterprise Resource Planning (ERP)** integrates MRP II with the information flow across an organization to manage and coordinate the ongoing activities of the enterprise, including product planning, manufacturing and distribution, accounting and finance, sales, human resources, and customer support.

Figure 11-18
Information Systems in the Enterprise

- A document management system (DMS) allows for storage and management of a company’s documents, such as word processing documents, presentations, and spreadsheets.
- A content management system (CMS) enables and manages the publishing, modification, organization, and access of various forms of documents and other files, including media and webpages, on a network or the web.

Information Systems in the Enterprise

- A transaction processing system (TPS) is an information system that captures and processes data from day-to-day business activities.
Information Systems in the Enterprise

- A management information system (MIS) is an information system that generates accurate, timely, and organized information, so that managers and other users can make decisions, solve problems, supervise activities, and track progress.

<table>
<thead>
<tr>
<th>Flight #</th>
<th>Origin/ Destination</th>
<th>Class – Number of Passengers</th>
<th>Premier Club Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>1048</td>
<td>ORD – RSW</td>
<td>A – 5</td>
<td>B – 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B – 8</td>
<td>C – 12</td>
</tr>
<tr>
<td>543</td>
<td>ORD – BNA</td>
<td>A – 2</td>
<td>A – 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B – 7</td>
<td>B – 5</td>
</tr>
<tr>
<td>215</td>
<td>ORD – LAX</td>
<td>A – 12</td>
<td>A – 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B – 25</td>
<td>B – 15</td>
</tr>
<tr>
<td>701</td>
<td>ORD – JFK</td>
<td>A – 9</td>
<td>B – 10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B – 7</td>
<td>C – 3</td>
</tr>
</tbody>
</table>

**Summary Flight Report for March 30**

<table>
<thead>
<tr>
<th>Flight #</th>
<th>Origin/ Destination</th>
<th>Passengers</th>
<th>Premier Club Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>1048</td>
<td>ORD – RSW</td>
<td>108</td>
<td>33</td>
</tr>
<tr>
<td>543</td>
<td>ORD – BNA</td>
<td>24</td>
<td>13</td>
</tr>
<tr>
<td>215</td>
<td>ORD – LAX</td>
<td>160</td>
<td>62</td>
</tr>
<tr>
<td>701</td>
<td>ORD – JFK</td>
<td>26</td>
<td>10</td>
</tr>
</tbody>
</table>

**Exception Flight Report for March 30**

<table>
<thead>
<tr>
<th>Flight #</th>
<th>Class</th>
<th>Origin/ Destination</th>
<th>Passengers</th>
<th>Premier Club Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>1048</td>
<td>A</td>
<td>ORD – RSW</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>701</td>
<td>C</td>
<td>ORD – JFK</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

- A decision support system (DSS) helps users analyze information and make decisions.
Information Systems in the Enterprise

• An **expert system** is an information system that captures and stores the knowledge of human experts and then imitates human reasoning and decision making.

Summary

- How data and information are valuable assets to an organization
- Methods for maintaining high-quality data
- Assessing the quality of valuable information
- Advantages of organizing data in a database
- Various types of databases
- Roles of the database analysts and administrators
- Database design guidelines
- Information systems used in an enterprise