Discovering Computers
Technology in a World of Computers, Mobile Devices, and the Internet

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	

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

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Databases, Data, and Information

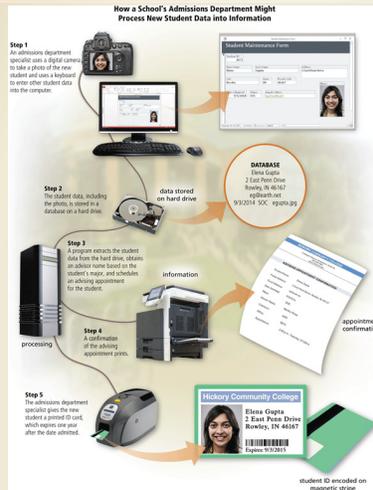| Database	Data	Information

• Collection of data organized in a manner that allows access, retrieval, and use of that data	• Collection of unprocessed items
	  • Text
	  • Numbers
	  • Images
	  • Audio
	  • Video
		• Processed data
		  • Organized
		  • Meaningful
		  • Useful

Databases, Data, and Information

How a School's Admissions Department Might Process New Student Data into Information

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Databases, Data, and Information

- **Database software**, often called a **database management system** (**DBMS**), allows users to:
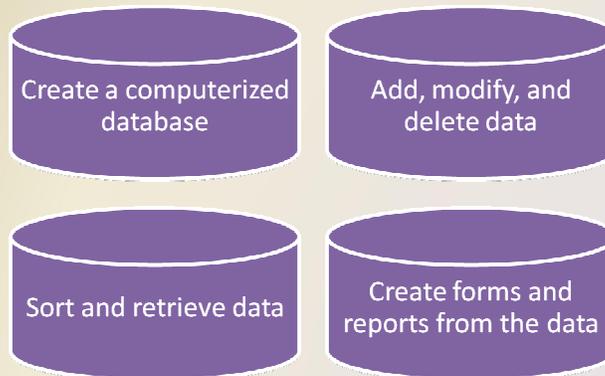
Create a computerized database

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

Databases, Data, and Information

- 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
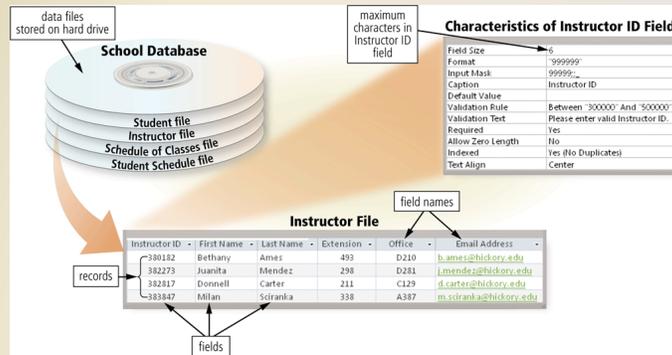
Databases, Data, and Information

- 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**
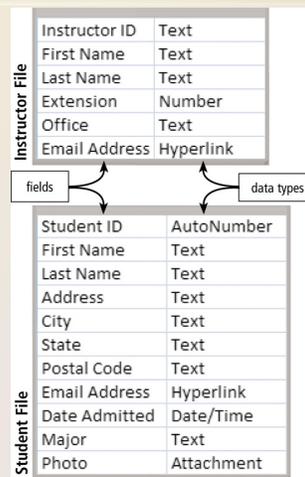
Databases, Data, and Information

- Common data types include:

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

Databases, Data, and Information

- 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

Sample Student File

Student ID	First Name	Last Name	Address	City	State	Postal Code	Email Address	Date Admitted	Major	Photo
2295	Milton	Brewer	54 Lucy Court	Charlestown	IN	46176		6/10/2013	EE	mbrewer.jpg
3876	Louella	Drake	33 Timmons Place	Bonner	IN	45208	lou@world.com	8/9/2013	BIO	ldrake.jpg
3928	Adelbert	Ruiz	99 Tenth Street	Sheldon	IN	46033		10/8/2013	CT	aruiz.jpg
2872	Benjamin	Tu	2204 Elm Court	Rowley	IN	46167	tu@indi.net	9/14/2014	GEN	btu.jpg

records   key field   fields

Databases, Data, and Information

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

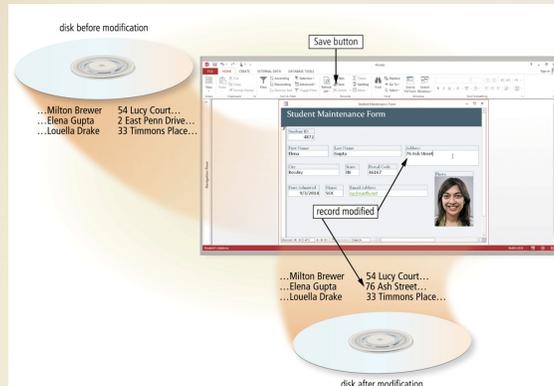| Adding records	Modifying records

Deleting records
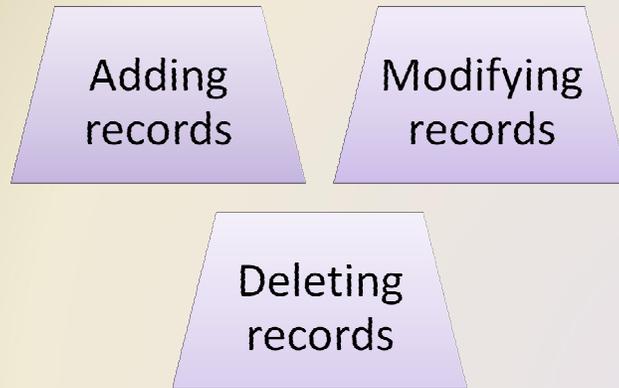
Databases, Data, and Information

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

Databases, Data, and Information

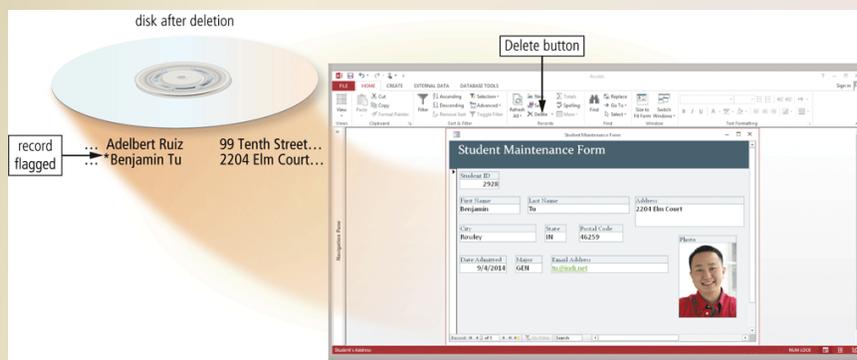- Users generally modify a record to correct inaccurate data or update old data

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

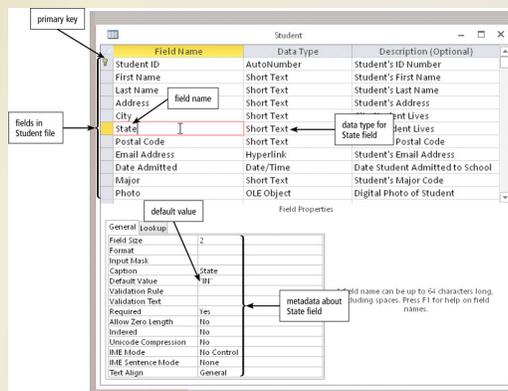| File processing system	Database approach
• Each department has its own set of files • Have data redundancy • Isolate data	• Programs and users share data • Reduced data redundancy • Improved data integrity • Shared data • Easier access • Reduced development time

File Processing Versus Databases

File Processing Example

Schedule of Classes File

Semester Code, Class Code, Class Section, Days, Times, Location, Current Enrollment, Maximum Enrollment, **Instructor ID, First Name, Last Name, Extension, Office, Email Address**

duplicated data

Instructor File

Instructor ID, First Name, Last Name, Extension, Office, Email Address

Database Example

Schedule of Classes File

Semester Code, Class Code, Class Section, Days, Times, Location, Current Enrollment, Maximum Enrollment, **Instructor ID**

only Instructor ID is duplicated

Instructor File

Instructor ID, First Name, Last Name, Extension, Office, Email Address

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Database Management Systems

- A **data dictionary** contains data about each file in the database and each field in those files

primary key

fields in Student file

field name

data type for State field

default value

metadata about State field

Field Name	Data Type	Description (Optional)
Student ID	AutoNumber	Student's ID Number
First Name	Short Text	Student's First Name
Last Name	Short Text	Student's Last Name
Address	Short Text	Student's Address
City	Short Text	...ent Lives
State	Short Text	...ent Lives
Postal Code	Short Text	Postal Code
Email Address	Hyperlink	Student's Email Address
Date Admitted	Date/Time	Date Student Admitted to School
Major	Short Text	Student's Major Code
Photo	OLE Object	Digital Photo of Student

Field Properties

General | Lookup

Field Size	2
Format	
Input Mask	
Caption	State
Default Value	"IN"
Validation Rule	
Validation Text	
Required	Yes
Allow Zero Length	No
Indexed	No
Unicode Compression	No
IME Mode	No Control
IME Sentence Mode	None
Text Align	General

...eld name can be up to 64 characters long, ...luding spaces. Press F1 for help on field names.

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

Database Management Systems

- 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

Database Management Systems

How to Use the Simple Query Wizard

Step 1
Select the fields from the Available Fields list you want to be displayed in the resulting query.
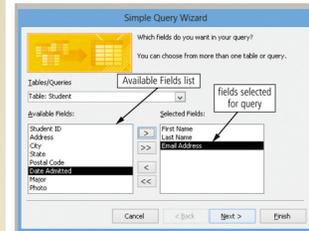
Step 2
Assign a name to the query, so that you can open it later.

SELECT FIRST NAME, LAST NAME, EMAIL ADDRESS
FROM STUDENT

query language statement generated by wizard

Step 3
View the query results on the screen.

Page 480
Figure 11-12

Database Management Systems

- Most DBMSs include **query by example** (**QBE**), a feature that has a graphical user interface to assist users with retrieving data
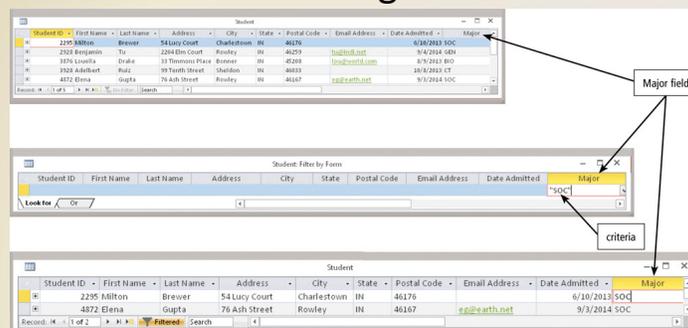
Major field

criteria

Page 481
Figure 11-13

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

Student List by Major

Major	Last Name	Student ID	First Name	Address	City	Date Admitted
BIO						
	Drake	3676	Louella	33 Timmons Place	Bonner	8/9/2013
CT						
	Ruiz	3928	Adelbert	99 Tenth Street	Sheldon	10/8/2013
GEN						
	Tu	2928	Benjamin	2204 Elm Court	Rowley	9/4/2014
SOC						
	Brewer	2295	Milton	54 Lucy Court	Charlestown	6/10/2013
	Gupta	4872	Elena	76 Ash Street	Rowley	9/3/2014

Database Management Systems

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	
File Processing Environment	**Relational Database Developer**	**Relational Database User**
File	Relation	Table
Record	Tuple	Row
Field	Attribute	Column

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
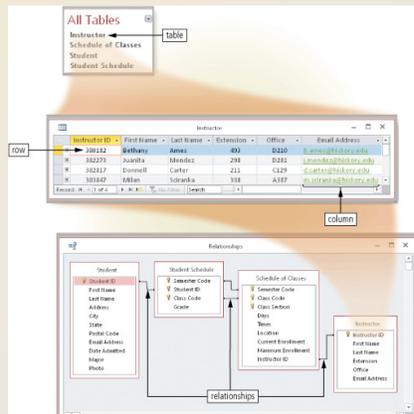
Relational, Object-Oriented, and Multidimensional Databases

- 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
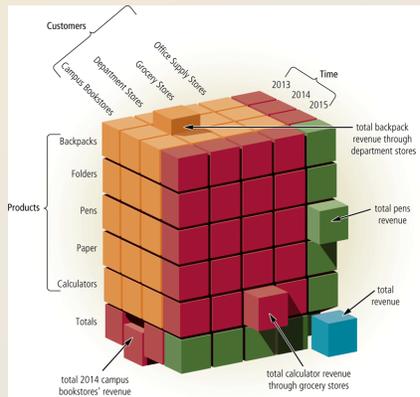
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Web Databases

- 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

Database Analyst (DA)

Decides on proper placement of fields, defines data relationship, and identifies users' access privileges

Database Administrator (DBA)

Creates and maintains the data dictionary, manages security of the database, monitors the performance of the database, and checks backup and recovery procedures

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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
Functional Unit	**Information System**
Human Resources (HR)	• *A human resources information system* (*HRIS*) manages one or more administrative human resources functions, such as maintaining and managing employee benefits, schedules, and payroll.
Engineering or Product Development	• *Computer-aided engineering* (*CAE*) aids in the development and testing of product designs, and often includes CAD (computer-aided design).
Manufacturing	• *Computer-aided manufacturing* (*CAM*) controls production equipment, such as drills, lathes, and milling machines. • *Material Requirements Planning* (*MRP*) monitors and controls inventory, material purchases, and other processes related to manufacturing operations. • *Manufacturing Resource Planning II* (*MRP II*) is an extension of MRP that also includes product packaging and shipping, machine scheduling, financial planning, demand forecasting, tracking labor productivity, and monitoring product quality.
Marketing	• Market research systems analyze data gathered from demographics and surveys.
Sales	• *Salesforce automation* (*SFA*) helps salespeople manage customer contacts, schedule customer meetings, log customer interactions, manage product information, and place customer orders.
Customer Service	• *Customer relationship management* (*CRM*) manages information about customers, past purchases, interests, and the day-to-day interactions, such as phone calls, email messages, web communications, and instant messaging sessions.

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

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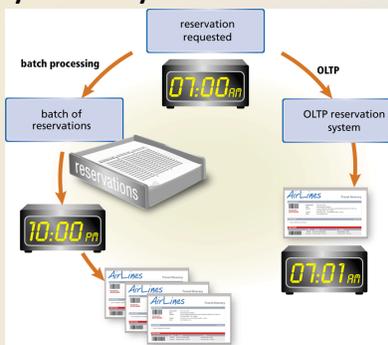# Information Systems in the Enterprise

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

Detailed Flight Report for March 30			
Flight #	Origin/ Destination	Class – Number of Passengers	Premier Club Members
1048	ORD – RSW	A – 5	A – 1
		B – 14	B – 12
		C – 89	C – 20
543	ORD – BMI	A – 2	A – 2
		B – 7	B – 5
		C – 15	C – 5
715	ORD – LAX	A – 12	A – 8
		B – 25	B – 15
		C – 123	C – 39
701	ORD – JFK	A – 9	A – 7
		B – 10	B – 0
		C – 7	C – 3

Summary Flight Report for March 30			
Flight #	Origin/ Destination	Passengers	Premier Club Members
1048	ORD – RSW	108	33
543	ORD – BMI	24	12
715	ORD – LAX	160	62
701	ORD – JFK	26	10

Exception Flight Report for March 30				
Flight #	Class	Origin/ Destination	Premier Club Members	Premier Club Member Goal
1048	A	ORD – RSW	1	4
701	C	ORD – JFK	3	5

Information Systems in the Enterprise

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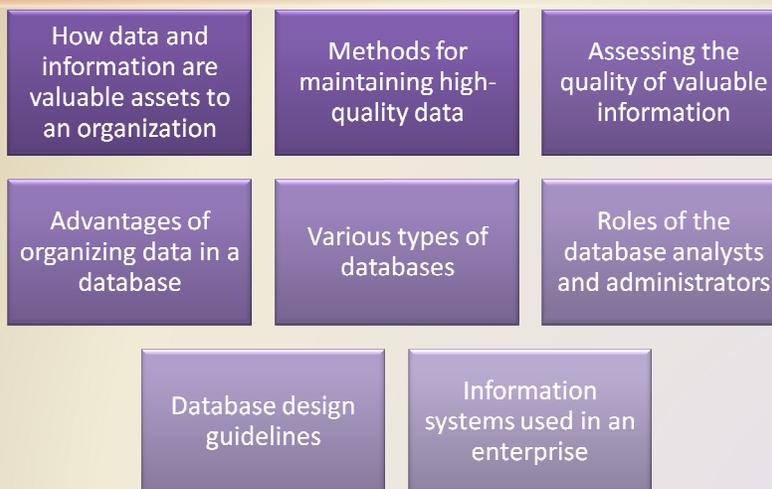
Information Systems in the Enterprise

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

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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	

Discovering Computers

Technology in a World of Computers, Mobile Devices, and the Internet

Chapter 11

Information and Data Management

Chapter 11 Complete