

## Chapter Topics

- Life without databases
- Database building blocks
- Database types
- Database management systems
- Relational database operations
- Data storage
- Managing data
- Data mining

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

2

A group of related fields is known as a:

1. Database
2. Record
3. Type
4. Primary key

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

A database is a collection of related data that can be stored, sorted, organized and:

1. queried
2. polled
3. tested
4. calculated

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

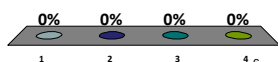
Which of the following is *NOT* an advantage of databases?

1. Data sharing
2. Flexible use of data
3. Data integrity
4. Data redundancy

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

A \_\_\_ is a large-scale electronic repository of data that contains and organizes all data related to an organization.

1. Information storage system
2. Data mart
3. Data warehouse
4. Information depository



Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

## Life Without Databases

- Not every situation demands complexity of a database
- For simple tasks, lists are adequate
  - Table created in Microsoft Word
  - Spreadsheet created in Microsoft Excel
- Lists are not appropriate for complex information

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

7

## Database Building Blocks

- Data that needs organization and analysis can be put into a database
  - eBay keeps track of millions of items
  - Netflix stores subscriber information

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

8

## Advantages of Using Databases

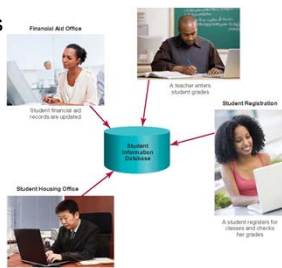
- Databases store and retrieve large quantities of information easily
- Provide information in seconds
- Three main advantages:
  - Enable information sharing
  - Promote data integrity
  - Allow flexible use of data

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

9

## More Database Advantages

- Using a database lets data be centralized, so that only one copy of relevant data must be maintained
- All database users therefore access the same up-to-date information



Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

10

## Database Terminology

- Databases have three main components;
  - Fields
    - Store each category of information
    - Displayed in columns
  - Records
    - Group of related fields
  - Tables (or files)
    - Group of related records

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

11

## Fields, Records, and Tables

Table containing student's contact information

SSN#	Last Name	Name	Address	City	State	Zip Code	Cell Phone
223456789	Finkat	Julio	643 Pine Street	Philadelphia	Pa.	19102-5734	(610) 555-2367
789123456	Garza	Julio	421 West 3rd St	New Witten	SD	57564-1234	(454) 555-6512
678912345	O'Connor	Leanne	238 Grant Street	Beverly	MA	01915-4333	(303) 555-8723
567891234	Stinson	Arthur	345 Ryan Drive	Cedar Falls	IA	50613-3232	(427) 555-2398
456789123	Zhang	Mei	457 Blanchard St	Boston	MA	01901-3424	(302) 555-4976

## Common Data Types

Data Type	Used to Store	Examples
Text	Alphabetic or alphanumeric data	Cecelia PSY 101
Numeric	Numbers	512 1.789
Calculated	Computational formula	Credit hours x per-credit tuition charges
Date	Dates in standard notation	2/21/2016
Memo	Long blocks of text	I have a dream that one day this nation will rise up and live out ...
Object	Multimedia files or document	MP3 file AVI file
Hyperlink	Hyperlink to a Web page	www.pearson highered.com

## Field Size

- Field size defines the maximum number of characters that a field can hold
- If you define a field size of 50, space is reserved for 50 characters
- Tailor field size to length of data it contains to avoid decreased performance

## Primary Keys

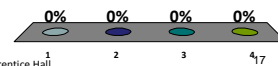
- Each record must have one field that has a value unique to that record
- Unique field is called a primary key
  - Student ID numbers
  - Social Security numbers
  - Driver's license numbers
  - Unique order numbers

## Database Types

- Three major types of databases are in use
  - Relational
  - Object-oriented
  - Multidimensional
- Relational databases have the largest market share
- Multidimensional databases are growing

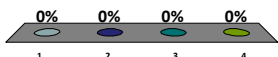
A \_\_\_ is a field value unique to a record.

1. Primary identifier
2. Primary key
3. Primary field
4. Primary gate



### Which of the following is an example of a primary key?

1. Last name
2. Phone number
3. Address
4. Student ID number



Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

### Relational Databases

- Organize data in table format
- Logically group similar data into a relation (a table that contains related data)
- Each record is assigned primary key
- Tables are linked to each other through their primary keys

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

19

### Object-Oriented Databases

- Store data in objects
- Also contain methods for processing or manipulating data
- Can store more types of data than relational databases
- Can access data faster

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

20

### Multidimensional Databases

- Store data in more than two dimensions
- Organize data in a cube format
- Each data cube has a *measure attribute*
  - Main type of data that cube is tracking
- Other elements are *feature attributes*
  - Describe measure attribute in meaningful way
- Can be easily customized
- Process data faster

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

21

### Database Management Systems

- Databases are created and managed using a database management system (DBMS)
- Four main operations of a DBMS:
  1. Creating databases and entering data
  2. Viewing (or browsing) and sorting data
  3. Querying (extracting) data
  4. Outputting data

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

22

### Creating Databases & Entering Data

- First define data to be captured
- Data dictionary or database schema
  - Defines name, data type, and length of each field

Field Name	Data Type
SID#	Number
Last Name	Text
First Name	Text
Address	Text
City	Text
StateAbbreviation	Text
Zip Code	Text

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

23

## Inputting Data

- Begin creating individual records
  - Key in directly
  - Import data electronically
- For small databases, create input form to speed data entry

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

24

## Data Validation

- Validation
  - Process of ensuring that data entered into the database is correct (or at least reasonable) and complete
- Common types of validation checks
  - Range
  - Completeness
  - Consistency
  - Alphabetic/numeric

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

25

I have received a completeness check message when filling out an online form.

1. Yes
2. No



Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

1

2

## Viewing and Sorting Data

- View records by browsing

OR

- Sort records by field name

SID#	First Name	Last Name	Address	City	State	Zip Code	Cell Phone
123456789	Susan	Finkel	645 Pine Street	Philadelphia	PA	19102-5678	(610) 555-2827
456789012	Mei	Zhang	457 Blanchard St	Boston	MA	02101-3456	(617) 555-4567
567890123	Arthur	O'Connor	345 Ryan Drive	Cedar Falls	IA	50613-3232	(319) 555-2345
678901234	Lianne	O'Connor	238 Grant Street	Beverly	MA	01915-4333	(978) 555-6789
789012345	Julio	Garza	421 West 3rd St	New Witten	SD	57584-1234	(605) 555-8901

SID#	Last Name	First Name	Address
123456789	Finkel	Susan	645 Pine Street
789012345	Garza	Julio	421 West 3rd St
678901234	O'Connor	Lianne	238 Grant Street
567890123	Stinson	Arthur	345 Ryan Drive
456789012	Zhang	Mei	457 Blanchard St

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

27

## Extracting or Querying Data

- Query is a question or inquiry
  - Provides records you wish to view
  - Select and display records that match certain criteria

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

28

## Simple Query Wizard

First Name	Last Name	Address	City	State	Zip Code
Susan	Finkel	645 Pine Street	Philadelphia	PA	19102-5678
Mei	Zhang	457 Blanchard St	Boston	MA	02101-3456
Arthur	Stinson	345 Ryan Drive	Cedar Falls	IA	50613-3232
Lianne	O'Connor	238 Grant Street	Beverly	MA	01915-4333
Julio	Garza	421 West 3rd St	New Witten	SD	57584-1234

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

29

## Query Languages

- Modern databases contain a query language used to retrieve and display records
- Most popular is Structured Query Language, or SQL
- Wizards speed up process of creating queries

## Outputting Data

- Most common form of output is a viewable or (printable) electronic report
- Summarize data and compile summary data reports
- Export data to other applications
  - Put data into an electronic file in a format that another application can understand

## Relational Database Operations

- Organize data into various tables based on logical groupings
- Methodology must be implemented to link data between tables

SID#	Last Name	First Name	Address	City
123456789	Finkel	Susan	645 Pine Street	Philadelphia
789123456	Garza	Julio	421 West 3rd St	New Witten
678912345	O'Connor	Leanne	238 Grant Street	Beverly
567891234	Stinson	Arthur	345 Ryan Drive	Cedar Falls
456789123	Zhang	Mei	457 Blanchard St	Boston

Registration	Class Code	SID#
1	CIS 110	123456789
2	ENG 101	123456789
3	HIS 103	123456789
4	CHE 140	123456789
5	PSY 101	123456789
12	PSY 101	456789123
13	HIS 103	456789123
14	ENG 102	456789123

## Types of Relationships

- One-to-one
  - For each record in a table, there is only one corresponding record in a related table
- One-to-many
  - Only one instance of a record in one table; many instances in a related table
- Many-to-many
  - Records in one table related to multiple records in another

## Normalization of Data

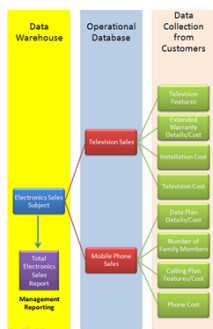
- Normalization of data reduces data redundancy by recording data only once
- Each table in a relational database should contain related data on a single topic
- Foreign key is the primary key of another table that is included to establish relationships with that other table

## Data Storage

- At simplest level, data is stored in single database on database server
- Problems arise when data is stored in multiple places
- Large storage depositories solve problem
  - Data warehouses
  - Data marts

## Data Warehouses

- Large-scale electronic repository of data
- Organizes in one place all the data related to an organization
- Consolidate information
- Data organized by subject



Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

36

## Populating Data Warehouses

- Source data can come from three places:
  - Internal sources
    - Company databases, etc.
  - External sources
    - Suppliers, vendors, etc.
  - Customers or visitors to company's Web site
    - Clickstream data

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

37

## Data Staging

- Source data must be “staged” before entering data warehouse
- Staging consists of three steps:
  1. Extraction of data from source
  2. Transformation (reformatting) the data
  3. Storage of data in the warehouse
- Software programs and procedures may have to be created to extract the data and reformat it for storage

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

38

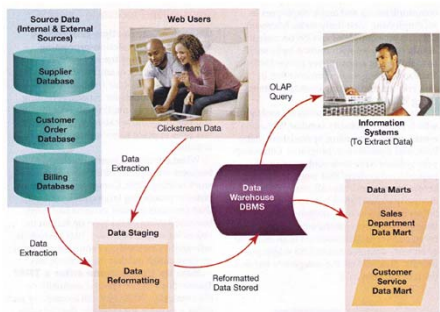
## Data Marts

- Looking for data in a data warehouse can be daunting
- Small slices of data warehouse, called a data mart are often created
- Data warehouses have an enterprise-wide depth
- Data marts may pertain to a single department

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

39

## Data Warehouse Process



Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

40

## Managing Data Information and Business Intelligence Systems

- Information system is a software-based solution to gather and analyze information
- All information systems perform:
  - Acquiring data
  - Processing that data into information
  - Storing the data
  - Providing the users with a number of output options

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

41

## Information Systems Categories

- Five categories of systems:
  1. Office support systems
  2. Transaction-processing systems
  3. Management information systems
  4. Decision support systems
  5. Enterprise resource planning (ERP) systems
- Each usually involves use of one or more databases

## Office Support Systems

- OSS designed to improve communications
- Assist employees in daily tasks
- *Example:* Microsoft Office assists employees with routine tasks
  - Maintaining phone list in Excel
  - Designing sales presentation in PowerPoint
  - Writing customer letters in Word

## Transaction-Processing Systems

A TPS keeps track of everyday business activities

- Batch processing
  - data is accumulated and several transactions are processed at once
- Real-time processing
  - database is queried and updated while transaction takes place

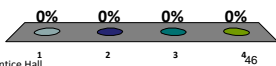


## Management Information Systems

- An MIS provides timely and accurate information for managers to make critical business decisions
- Types of MIS reports:
  - Detail report
  - Summary report
  - Exception report

## Which is *NOT* a category of information systems?

1. Office support
2. Data storage
3. Transaction-processing
4. Enterprise resource planning (ERP)



## MIS Reports

### Detail Report

Daily Enrollment Report				
SID#	First Name	Last Name	Class Code	Class Name
123456789	Susan	Fisher	CHE 140	Chemistry
			CIS 110	Computer Literacy
			ENG 101	English Comp 1
			HIS 103	Western Civ 1
			PSY 101	Intro to Psychology
456789123	Mai	Zhang	ENG 102	English Comp 2
			HIS 103	Western Civ 1
			PSY 101	Intro to Psychology

### Summary Report

Daily Enrollment Summary	
Division	Enrolled Credits
Computer Science	2
Humanities	3
Science and Engineering	2
Social Sciences	7
<b>Total Credits</b>	<b>14</b>

### Exception Report

Course Sections Fully Enrolled	
Class Code	Class Name
CIS 110	Computer Literacy
ENG 102	English Comp 2
HIS 103	Western Civ 1



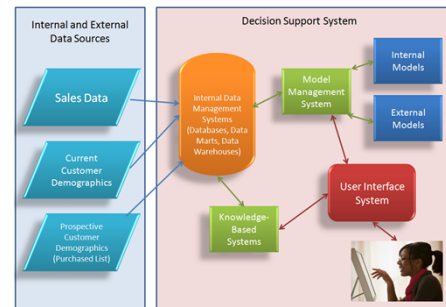
## Decision Support Systems

- A DSS helps managers develop solutions for specific problems
  - Uses data from databases and data warehouses
  - Enables users to add own insights and experiences and apply them to the solution

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

48

## Major DSS Components



Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

49

## Internal & External Data Sources

- Internal data sources are maintained by same company that operates DSS
- An external data source is any source not owned by company that owns the DSS
  - Data purchased from third parties
  - Mailing lists
  - Statistics from federal government

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

50

## Model Management Systems

- Software that assists in building management models in DSSs
- Can be built to describe any business situation
- Internal and external models
- Typically contain financial and statistical analysis tools

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

51

## Knowledge-Based Systems

- Provides additional intelligence that supplements user's own intellect
- Natural language processing (NLP) system: Enables users to communicate with computers using a natural spoken or written language
- Artificial intelligence (AI): Branch of computer science that deals with attempt to create computers that think like humans
- Support concept of fuzzy logic

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

52

## Enterprise Resource Planning Systems

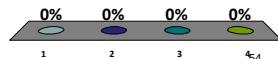
- An ERP system is a broad-based software system that integrates multiple data sources
- Enables smooth flow of information
- Use common database to store and integrate information
- Allow information to be used across multiple areas of an enterprise

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

53

What is the process by which great amounts of data are analyzed and investigated?

1. Data mining
2. Record selection
3. Data formatting
4. Data management



Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

## Data Mining

- Process by which great amounts of data are analyzed and investigated
- Objective is to spot significant patterns or trends within the data
- Businesses mine data to understand their customers better

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

55

## Data Mining Methods

- Classification
  - Define data classes
- Estimation
  - Assign a value to data
- Affinity grouping (or association rules)
  - Determine which data goes together
- Clustering
  - Organize data into subgroups
- Description and visualization
  - Get a clear picture of what is happening

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

56

## Ethics in IT

- Ever-increasing amount of information about you and your habits is available
  - Credit card transactions
  - Banking transactions
  - Frequent buyer cards
  - Toll records
  - Prescription history and medical records

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

57

## Ask the Following Questions:

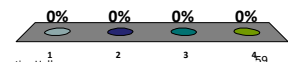
- For what purpose is the data being gathered?
- Are the reasons for gathering the data legitimate or important to you?
- How will the information gathered be protected once it has been obtained?
- Will the information collected be used for purposes other than those for which it was originally collected?
- Could the information be used for identity theft?
- Are organizations that already have your data safeguarding it?

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

58

A \_\_\_\_\_ is a category of information displayed in a column.

1. Type
2. Record
3. Field
4. Size

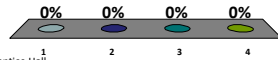


Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

59

\_\_\_\_\_ includes data such as audio clips, video clips, pictures, and large documents.

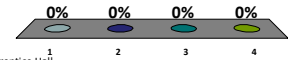
- 1. Management data
- 2. Unstructured data
- 3. Digital data
- 4. Optical data



Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

\_\_\_\_\_ occurs when duplicate data is entered into a database.

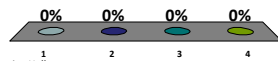
- 1. Data frequency
- 2. Data repetition
- 3. Data redundancy
- 4. Data mirroring



Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

Which of the following indicates what type of data can be stored in a field?

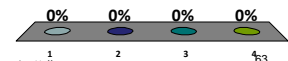
- 1. Data type
- 2. Query
- 3. Record selection
- 4. Field size



Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

Which is *NOT* one of the three relationships in a relational database?

- 1. One-to-one
- 2. One-to-many
- 3. One-to-two
- 4. Many-to-many



Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

### Chapter 11 Summary Questions

- 1. What is a database, and why is it beneficial to use databases?

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

64

### Chapter 11 Summary Questions

- 2. What components make up a database?

Copyright © 2013 Pearson Education, Inc. Publishing as Prentice Hall

65

### Chapter 11 Summary Questions

3. What types of databases are there?

### Chapter 11 Summary Questions

4. What do database management systems do?

### Chapter 11 Summary Questions

5. How do relational databases organize and manipulate data?

### Chapter 11 Summary Questions


6. What are data warehouses and data marts, and how are they used?

### Chapter 11 Summary Questions

7. What is business intelligence system, and what types of business intelligence systems are used by decision makers?

### Chapter 11 Summary Questions

8. What is data mining, and how does it work?



**This work is protected by United States copyright laws and is provided solely for the use of instructors in teaching their courses and assessing student learning. Dissemination or sale of any part of this work (including on the World Wide Web) will destroy the integrity of the work and is not permitted. The work and materials from it should never be made available to students except by instructors using the accompanying text in their classes. All recipients of this work are expected to abide by these restrictions and to honor the intended pedagogical purposes and the needs of other instructors who rely on these materials.**

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher. Printed in the United States of America.

Copyright © 2013 Pearson Education, Inc.  
Publishing as Prentice Hall