Discovering Computers 2016

Tools, Apps, Devices, and the Impact of Technology

Chapter 11

Building Solutions

Databases, Data, and Information

Database

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

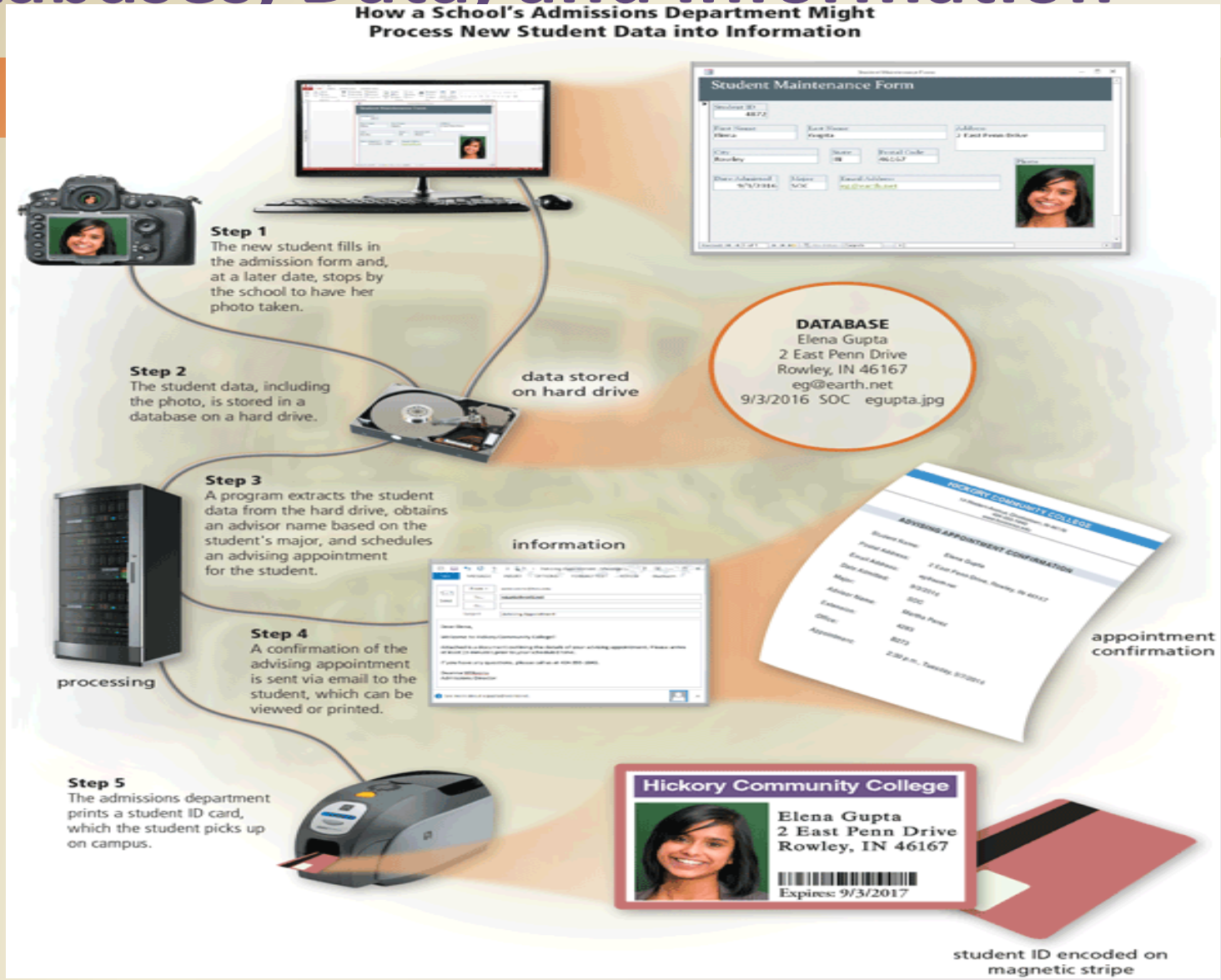
Data

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

Information

- Processed data
  - Organized
  - Meaningful
  - Useful

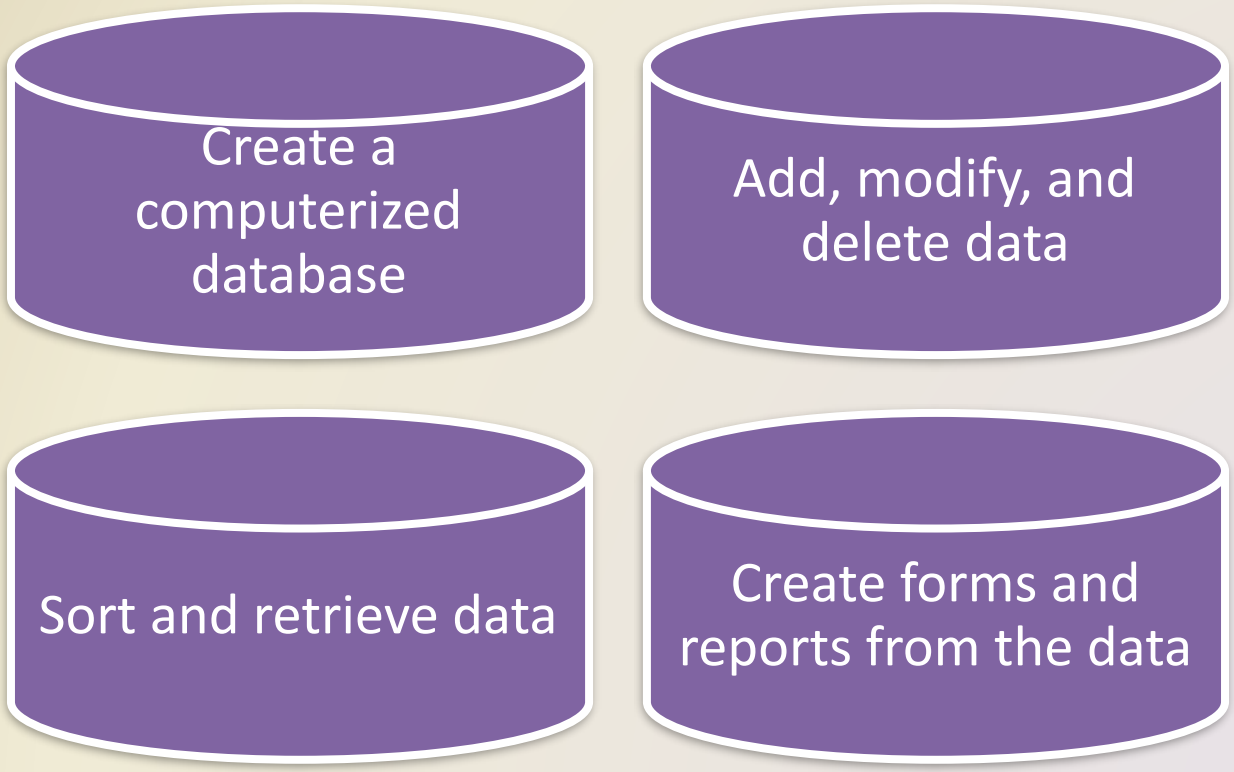
Databases, Data, and Information



Page 499
Figure 11-1

Databases, Data, and Information

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



Databases, Data, and Information

- Data is organized in levels
  - Characters, fields records, and files

Pages 500 - 501
Figure 11-2

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**

Page 500
Figure 11-3

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

Page 501
Figure 11-4

Databases, Data, and Information

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

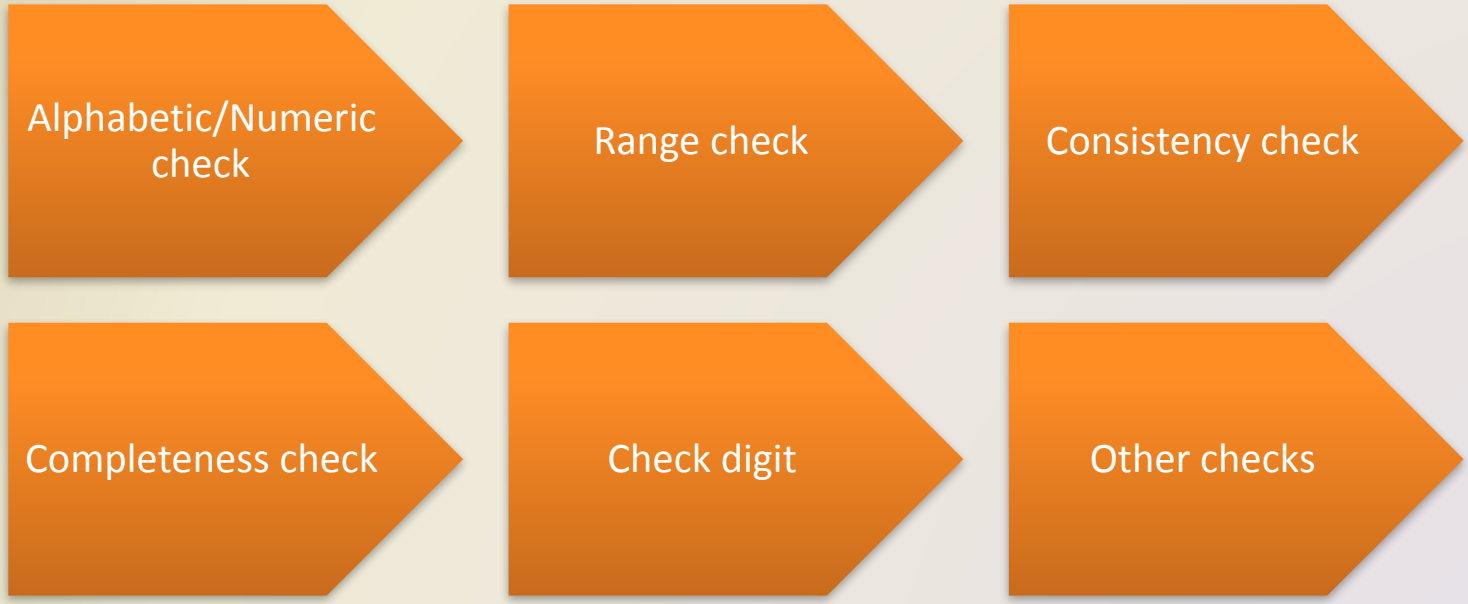
Adding records

Modifying records

Deleting records

Databases, Data, and Information

- **Validation** compares data with a set of rules or values to find out if the data meets certain criteria



Data validation is the practice of checking the integrity, accuracy and structure of data before it is used for a business operation. Data validation operation results can provide data used for data analytics, business intelligence or training a machine learning model.

File Processing Systems and Databases

File processing system

- Each department has its own set of files
- Redundant data
- Isolated data

Database approach

- Programs and users share data
- Reduced data redundancy
- Improved data integrity
- Shared data
- Easier access
- Reduced development time

Data redundancy refers to the practice of keeping data in two or more places within a database or data storage system.

Database isolation refers to the ability of a database to allow a transaction to execute as if there are no other concurrently running transactions (even though in reality there can be a large number of concurrently running transactions)

File Processing Systems and Databases

Page 505
Figure 11-6

File Processing Systems and Databases

- Disadvantages of a database approach
  - Can be more complex than a file processing system
  - Require more memory and processing power
  - Data can be more vulnerable

File Processing Systems and Databases

- Web databases offer information about:

Jobs	Travel	Destinations	Television programming
Photos	Movies	Videos	Local and national weather
	Sporting events	Legislative information	

File Processing Systems and Databases

- A **data model** defines how users view the organization of the data

Relational database

Object-oriented database (OODB)

Multidimensional and other database types

Relational database

- A **relational database** includes tables containing rows and columns. For example, a typical business order entry database would include a table that describes a customer with columns for name, address, phone number and so forth.

object-oriented database (OOD)

- An **object-oriented database (OOD)** is a database system that can work with complex data objects — that is, objects that mirror those used in object-oriented programming languages. In object-oriented programming, everything is an object, and many objects are quite complex, having different properties and methods.
- A **database** management system (DBMS) that supports the modeling and creation of data as objects.

Multidimensional database

- **A multidimensional database is created from multiple relational databases**. While relational databases allow users to access data in the form of queries, the multidimensional databases allow users to ask analytical questions related to business or market trends.
- A multidimensional database (MDB) is **a type of database that is optimized for data warehouse and online analytical processing (OLAP) applications**. MDBs are frequently created using input from existing relational databases.

Database Management Systems

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

Page 510
Figure 11-7

Data Dictionary

- A **Data Dictionary** is a collection of names, definitions, and attributes about data elements that are being used or captured in a database, information system, or part of a research project.
- For example, a bank or group of banks could model the data objects involved in consumer banking. They could then provide a data dictionary for a bank's programmers. The data dictionary would **describe each of the data items in its data model for consumer banking, such as "Account holder" and "Available credit."**

Database Management Systems

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

Query language & Query by example

- A **query language** is a specialized programming language for searching and changing the contents of a database.
- **Query by example**
- A query can either be a request for data results from your database or for action on the data, or for both.
- A query can give you an answer to a simple question, perform calculations, combine data from different tables, add, change, or delete data from a database.
- SELECT * FROM **shop** ORDER BY **article**;

Form in database

- In a database context, a **form** is a window or screen that contains numerous fields, or spaces to enter data. Each field holds a field label so that any user who views the form gets an idea of its contents.
- A **form** is more user friendly than generating queries to create tables and insert data into fields.
- **Form** is a term that means the style in which a text is written.
- Some examples of **forms** include scripts, novels and the various different types of poetry.

Report writer

- Also called a **report generator**, a program, usually part of a database management system, that extracts information from one or more files and presents the information in a specified format.
- A **report writer** is a professional who collects, analyses and converts complex raw data and comprehensive information into **written reports**. These **reports** are easy for the average reader or non-technical employees to understand.

Database Management Systems

- A **query** is a request for specific data from the database
- 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

Database Management Systems

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

Page 512
Figure 11-9

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

Pages 512 - 513
Figure 11-10

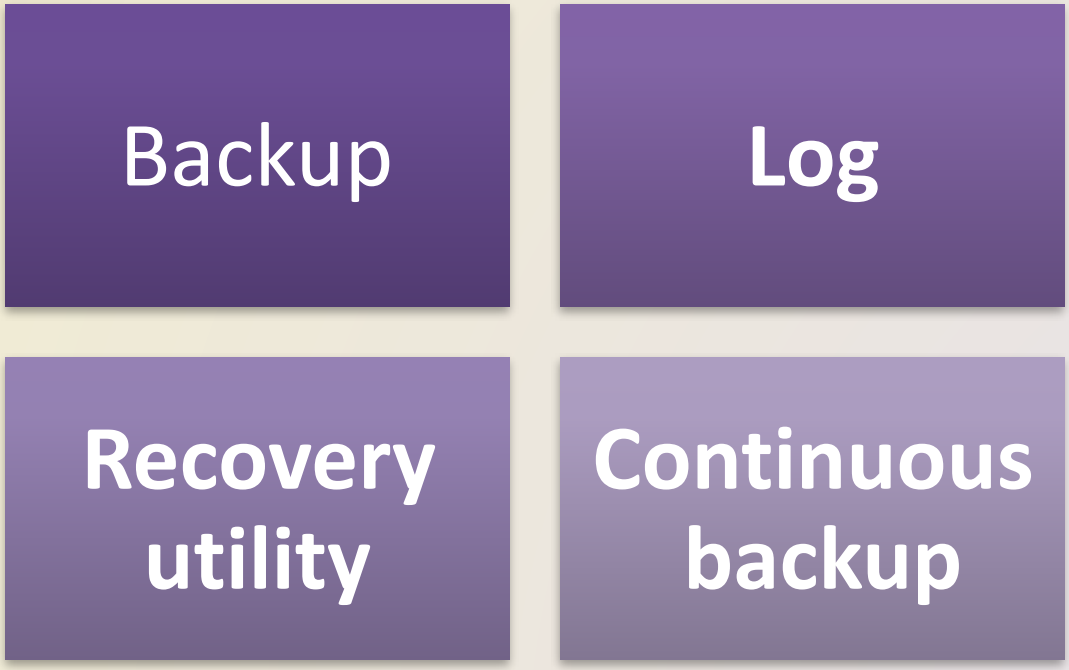
Database Management Systems

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



System Development

- An *information system* is a collection of hardware, software, data, people, and procedures that work together to produce information.
- As a user of technology in a business, you some day may participate in the modification of an existing information system or the development of a new one. Thus, it is important that you understand system development.
- **System development** is a set of activities used to build an information system. System
- Development activities often are grouped into larger categories called *phases*.
- This collection of phases sometimes is called the **system development life cycle** (**SDLC**).
- Many traditional SDLCs contain five phases
- **1. Planning**
- **2. Analysis**
- **3. Design**
- **4. Implementation**
- **5. Support and Security**

Application Development Languages and Tools

- The previous sections discussed the system development phases.
- One activity during the implementation phase is to develop programs and apps.
- Although you may never write a program or app, information you request may require a software developer to create or modify a program or app.
- Thus, you should understand how software developers, sometimes called programmers, create programs and apps to meet information requirements.