

Introduction to Information and Communication Technologies

Chapter 9

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Agenda

- Databases, data, and information
- The hierarchy of data
- Maintaining data
- File processing versus databases
- Database management systems
- Relational, object-oriented, and multidimensional databases
- Web databases
- Database administration

DATABASES, DATA, AND INFORMATION

- **Data** is a collection of unprocessed items, which can include text, numbers, images, audio, and video.
- **Information** is processed data; that is, it is organized, meaningful, and useful.
- **database** is a collection of data organized in a manner that allows access, retrieval, and use of that data.
- With **database software**, often called a **database management system (DBMS)**,
 - users create a computerized database;
 - add, change, and delete data in the database;
 - sort and retrieve data from the database; and
 - create forms and reports from the data in the database.

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DATABASES, DATA, AND INFORMATION

- For a computer to produce correct information, the data that is entered into a database must have integrity. **Data integrity** identifies the quality of the data.
- An erroneous member address in a member database is an example of incorrect data. When a database contains this type of error, it loses integrity.
- Data integrity is very important because computers and people use information to make decisions and take actions.
- **Garbage in, garbage out (GIGO)** is a computing phrase that points out the accuracy of a computer's output depends on the accuracy of the input. If you enter incorrect data into a computer (garbage in), the computer will produce incorrect information (garbage out).

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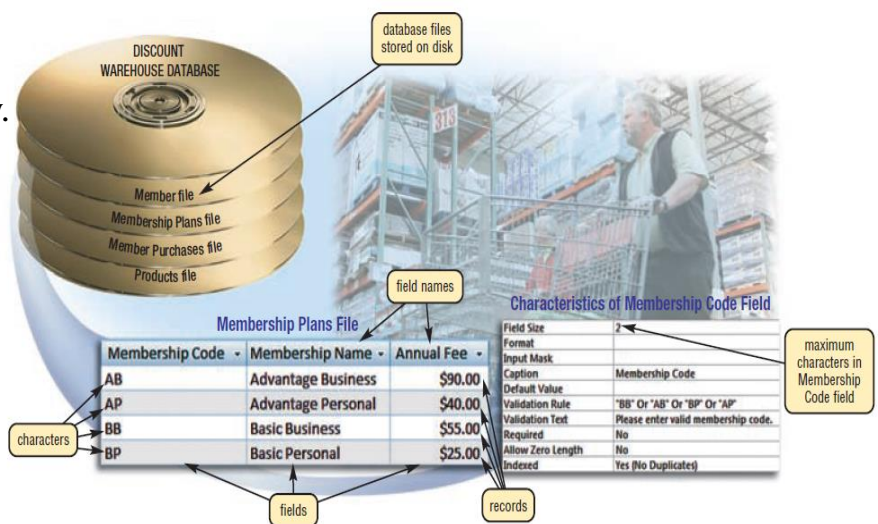
Qualities of Valuable Information

- To assist with sound decision making, the information must have value. For it to be valuable, information should be accurate, verifiable, timely, organized, accessible, useful, and cost-effective.
 - **Accurate** information is error free. Inaccurate information can lead to incorrect decisions.
 - **Verifiable** information can be proven as correct or incorrect
 - **Timely** information has an age suited to its use.
 - **Organized** information is arranged to suit the needs and requirements of the decision maker.
 - **Accessible** information is available when the decision maker needs it. Having to wait for information may delay an important decision.
 - **Useful** information has meaning to the person who receives it. Most information is important only to certain people or groups of people.
 - **Cost-effective** information should give more value than it costs to produce.

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THE HIERARCHY OF DATA

- Data is organized in layers. In the computer profession, data is classified in a hierarchy. Each higher level of data consists of one or more items from the lower level. For example, a member has an address, and an address consists of letters and numbers.



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THE HIERARCHY OF DATA

- **Characters:** As Chapter 4 discussed, a bit is the smallest unit of data the computer can process. Eight bits grouped together in a unit comprise a byte. In the ASCII and EBCDIC coding schemes, each byte represents a single **character**, which can be a number (4), letter (R), punctuation mark (?), or other symbol (&).
- A **field** is a combination of one or more related characters or bytes and is the smallest unit of data a user accesses. A **field name** uniquely identifies each field. When searching for data in a database, you often specify the field name. Field names for the data in the Membership Plans file are Membership Code, Membership Name, and Annual Fee.
- A database uses a variety of characteristics, such as field size and data type, to define each field.

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THE HIERARCHY OF DATA

- A **record** is a group of related fields. For example, a member record includes a set of fields about one member. A **key field**, or **primary key**, is a field that uniquely identifies each record in a file. The data in a key field is unique to a specific record. For example, the Member ID field uniquely identifies each member because no two members can have the same Member ID.
- A **data file** is a collection of related records stored on a storage medium such as a hard disk, CD, or DVD. A Member file at a discount warehouse might consist of hundreds of individual member records. Each member record in the file contains the same fields. Each field, however, contains different data.

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MAINTAINING DATA

- **Adding Records:** Users add new records to a file when they obtain new data.
- **Changing Records:** Generally, users change a record in a file for two reasons:
 1. to correct inaccurate data or
 2. to update old data with new data.
- **Deleting Records:** When a record no longer is needed, a user deletes it from a file.
- **Validating Data: Validation** is the process of comparing data with a set of rules or values to find out if the data is correct. Many programs perform a validity check that analyzes entered data to help ensure that it is correct.

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FILE PROCESSING VERSUS DATABASES

- In a typical **file processing system**, each department or area within an organization has its own set of files. The records in one file may not relate to the records in any other file.
- Companies have used file processing systems for many years. A lot of these systems, however, have two major weaknesses: they have redundant data and they isolate data.
- **Data Redundancy** — Each department or area in a company has its own files in a file processing system. Thus, the same fields are stored in multiple files. Data redundancy also can increase the chance of errors which leads to data inconsistency
- **Isolated Data** — Often it is difficult to access data stored in separate files in different departments. Sharing data from multiple, separate files is a complicated procedure and usually requires the experience of a computer programmer.

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FILE PROCESSING VERSUS DATABASES

- When a company uses the **database approach**, many programs and users share the data in the database.
- The following list presents some strengths of the database approach.
- **Reduced Data Redundancy** — Most data items are stored in only one file, which greatly reduces duplicate data. Figure 9-10 demonstrates the differences between how a database application and a file processing application might store data.
- **Improved Data Integrity** — When users modify data in the database, they make changes to one file instead of multiple files. Thus, the database approach increases the data's integrity by reducing the possibility of introducing inconsistencies.
- **Shared Data** — The data in a database environment belongs to and is shared, usually over a network, by the entire organization. Companies that use databases typically have security settings to define who can access, add, change, and delete the data in a database.
- **Easier Access** — The database approach allows nontechnical users to access and maintain data, providing they have the necessary privileges.
- **Reduced Development Time** — It often is easier and faster to develop programs that use the database approach.

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To be Continued