

Introduction to Databases

by Sophia



WHAT'S COVERED

You have already been introduced to the first two components of information systems: hardware and software. However, those two components by themselves do not make a computer useful. Imagine if you turned on a computer and started the word processor, but could not save a document. Imagine if you opened a music player, but there was no music to play. Imagine opening a web browser, but there are no web pages. Without data, hardware and software are not very useful! Data is the third component of an information system. In this tutorial, we will take a look at the primary way in which data is collected, stored, and retrieved.

Our discussion will break down as follows:

1. Data and Information

Data are the raw bits and pieces of information with no context. Data can be **quantitative** or **qualitative**. Quantitative data is numeric — the result of a measurement, count, or some other mathematical calculation. Qualitative data is descriptive. “Ruby Red,” the color of a 2013 Ford Focus, is an example of qualitative data. By itself, data is not that useful. To be useful, data needs to be given context. For example, if I told you, “15, 23, 14, 85,” you would not have learned anything, but I would have given you data. Conversely, if I told you that 15, 23, 14, and 85 are the numbers of students that had registered for upcoming classes, that would be *information*. By adding the context — that the numbers represent the count of students registering for specific classes — I have converted data into information.



TERMS TO KNOW

Quantitative Data

Numeric data that is the result of a measurement, count, or some other mathematical calculation.

Qualitative Data

Data that is descriptive.

2. What is a Database?

The goal of many information systems is to transform data into information in order to generate knowledge that can be used for decision-making. In order to do this, the system must be able to take data, put the data

into context, and provide tools for search, data manipulation, modification, and deletion. A *database* is designed for just such a purpose. A **database** is an organized collection of related information. It is considered an *organized* collection, because in a database, all data is described and associated with other data. All information in a database should be *related* as well; separate databases should be created to manage unrelated information. For example, a database that contains information about students should not also hold information about company stock prices. Everyday examples of databases include phone books, a list of songs on a hard disk with the song length, or a list of student names with their birthdates. Additionally, databases are also working behind websites and data-driven web applications, such as the number of student absences.



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Database

An organized collection of related information.

3. Elements of a Database

A database can be composed of many different elements and features. In essence, a database is one or more tables composed of records and fields that hold data.

- **Tables:** A **table** is a way to organize data using rows and columns. Ideally, a separate table will be used to hold data about each aspect of a particular subject. As an example, if you were going to design a database that holds information about a high school, you may want to have a table that holds information about course offerings, and in a separate table, provide information about who teaches a particular course offering and the time it is taught.
- **Records:** A **record** is a row in a database table, and it contains all of the data associated with that particular item. For example, a record in a table about student enrollments might be John Doe, plus all of the information collected about him, such as his phone number, email address, and student ID number. A row is also sometimes called a tuple.
- **Fields:** A **field** is a column in a database table, and it contains one unique piece of information related to the record. For example, if a record included information about John Doe's phone number, email address, and student ID number, then the labels of phone number, email address, and student ID number are all fields in the database, that collect those pieces of information for other students in the database. All fields hold the specified data type required by the information contained within the field; in a field entitled "salary" the data type is set to number. That way, salary will always be formatted as a number.



WATCH

Check out the video below that describes elements of a database.



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Table

Collection of related data.

Record

An entry in a database that contains all the data about one instance of a particular person, company, or item.

Field

A fundamental element of a record; contains one unique piece of information about the record.

4. Database Types

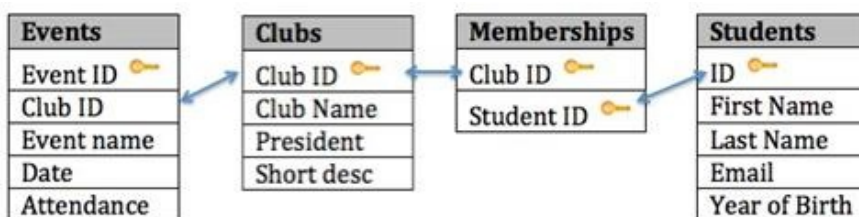
Databases can be organized in many different ways, and can take many forms. A **flat file database** is a simple type of database that, at its core, contains a single table of information. A table is a set of data organized into rows and columns with the intersection of a row and column forming a cell. The flat file design places all information into one single table with no information sharing between multiple tables. Therefore, a flat file database does not give a user the ability to view, edit, or manipulate data in two separate tables simultaneously. Additionally, making edits in one table will not change the contents of another. This type of database is best used in situations in which users only need to store, edit, print, or display data. A flat file database can be created using a spreadsheet application. In fact, you can create this type of database using a simple text editor such as Notepad, using commas to separate the columns and paragraph breaks to separate the rows.

ID	First Name	Last Name	Email	Year of Birth
1	Peter	Lee	plee@university.edu	1992
2	Jonathan	Edwards	jedwards@university.edu	1994
3	Marilyn	Johnson	mjohnson@university.edu	1993
6	Joe	Kim	jkim@university.edu	1992
12	Haley	Martinez	hmartinez@university.edu	1993
14	John	Mfume	jmfume@university.edu	1991
15	David	Letty	dletty@university.edu	1995

Table: Students

Flat file database

The most popular form of database today is the relational database. In a **relational database**, all the tables are related by one or more fields, so that it is possible to connect all the tables in the database through the field(s) they have in common. Connected tables are advantageous, because the tables and the information contained within them can be searched, edited, manipulated, and stored while working from one file. Relational databases are also able to share information between devices and over networks such as the Internet. In fact, relational databases have come to play a major role on the Internet as they are utilized frequently by web developers to design data-driven websites. Popular examples of relational databases are Microsoft Access, MySQL, and Oracle.



Relational database



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Flat File Database

Simple type of database that, at its core, contains a single table of information.

Relational Database

A database in which all the tables are related by one or more fields.



SUMMARY

A **database** provides a way to maintain and store data in a structured format, such as an address book or a list of hotels. Each person or item is a record; each type of information stored is a field. In this tutorial we explored what a **database** is, the **elements of a database**, and the **different types of databases**.

Source: Derived from Chapter 4 of “Information Systems for Business and Beyond” by David T. Bourgeois. Some sections removed for brevity.

<https://www.saylor.org/site/textbooks/Information%20Systems%20for%20Business%20and%20Beyond/Textbook.html>



TERMS TO KNOW

Database

An organized collection of related information.

Field

A fundamental element of a record; contains one unique piece of information about the record.

Flat File Database

Simple type of database that, at its core, contains a single table of information.

Qualitative Data

Data that is descriptive.

Quantitative Data

Numeric data that is the result of a measurement, count, or some other mathematical calculation.

Record

An entry in a database that contains all the data about one instance of a particular person, company, or item.

Relational Database

A database in which all the tables are related by one or more fields.

Table

A collection of related data.