

4.2: Examples of Data

Data can be anything that are factual and can't be disputed.

Some examples of data are weights, prices, costs, numbers of items sold, names, places, an image, a song. Almost all software programs require data to do something useful. It can be straightforward, as a name of a place, a person, or a number. An example would be editing a document in a word processor such as Microsoft Word, the document you are working on is the data. The word-processing software can manipulate the data: create a new document, duplicate a document, or modify a document. Today we have a new type of data called biometrics, which are physical or behavioral human characteristics that can digitally identify a person. Examples would be facial recognition used for passports. Fingerprint authentication is used to unlock smartphones. Iris recognition uses high-resolution images of the iris. This data is stored for future identification. Many governments and high-security companies use iris recognition because it is considered to be errorless when identifying individuals.

4.2.1: Databases

Definition: Database, DBMS

A **database** is an organized collection of data stored in a computer system. Databases allow for the storage and retrieval of large amounts of information in a structured and interrelated manner through the use of electronic tables, indexes, queries, and other mechanisms.

A **Database management system** (DBMS) is the software used to manage and query a database.

We will give an overview of database fundamentals. Many information systems aim to transform data into information to generate knowledge that can be used for decision-making. To do this, the system must take or read the data, then put the data into context, and provide tools for aggregation and analysis. A database is designed for just such a purpose.

A database is an organized, meaningful collection of related information. It is an organized collection because, in a database, all data is interrelated and associated with other data. All information in a database should be related; separate databases should be created to manage unrelated information. For example, a database that contains information about employees' payroll should not also hold information about the company's stock prices.

Digital databases include things created by MS Excel, such as tables to more complicated databases used every day by people, from checking your balance at the bank to accessing medical records and online shopping. Databases help us to eliminate redundant information. It ensures more effective ways to access searches. Databases would be a filing cabinet before the arrival of computing. For this text, we will only consider digital databases.

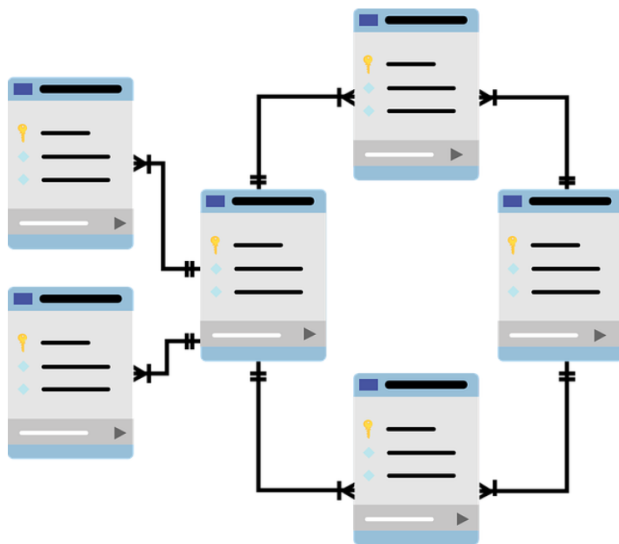


Figure 4.2.1: Relational Database. Image by [mcmurry](#).

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4.2.2: Relational Databases

Databases can be organized in many different ways and thus take many forms. DBMS (Database Management System) is software that facilitates the organization and manipulation of data. DBMS functions as an interface between the database and the end-user. The software is designed to store, define, retrieve and manage the data in the database. Other forms of databases today are relational databases.

Definition: Relational Database

A relational database is a type of database that structures its data into relations, which are essentially tables consisting of rows and columns.

- Each row represents a record with a unique ID called the key and has a set of fields to define the nature of the data stored in the table.
- Each column represents fields in the table, stores the attributes for that record

Relational databases establish predefined relationships between their tables through the use of foreign keys, which create connections between rows in different tables, as shown in Figure 4.2.2.

To visualize this, think of an Excel spreadsheet, the records as the rows of the table and the fields as the table columns. In the example below, we have a table of student information, with each row representing a student and each column representing one piece of information about the student.

Relational Database Example

Figure 4.2.2: Relational database table adapted from [David Bourgeois, Ph.D.](#) is licensed under [CC BY 4.0](#)

Fields (Columns)				
Records (Rows)	First Name	Last Name	Major	Birthdate
	Ann Marie	Strong	Pre-Law	2/27/1997
	Evan	Right	Business	12/4/1996
	Michelle	Smith	Math	6/27/1995

Relational databases include Oracle (RDBMS), MySQL, SQL, and PostgreSQL.

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