

Getting Data In, Getting Results Out

Be a Power Reader

Build on Previous Knowledge Before you begin this article, spend a minute thinking about what you already know concerning input and output devices. List the devices that you have used. Then see what new devices you learn about in this article. Build on the knowledge you already have to make connections to new information.

Managing Money

Charlotte has received some money for her fifteenth birthday. She is now pondering what to do with the money. Charlotte plans to attend college in a few years. Her parents cannot afford to pay for everything she will need in college. So, Charlotte needs to save some of her money. Even so, she wants to celebrate her birthday by purchasing a couple of books and DVDs. How does she decide how much money to save, how much to spend on books, and how much to spend on DVDs?

In this case, Charlotte has a few “givens” (her raw **data**):

- She has \$250.
- Some of the money must be saved.
- Books cost an average of \$6.50 each.
- DVDs cost an average of \$18 each.

Charlotte opens a **spreadsheet application** on her computer. She enters her “givens” and then explores what happens when she changes their values. This lets Charlotte see that by changing the quantity of books she purchases, she also changes the quantity of DVDs she can purchase. Increasing or decreasing the amount she saves also affects the quantity of books and DVDs she can buy.

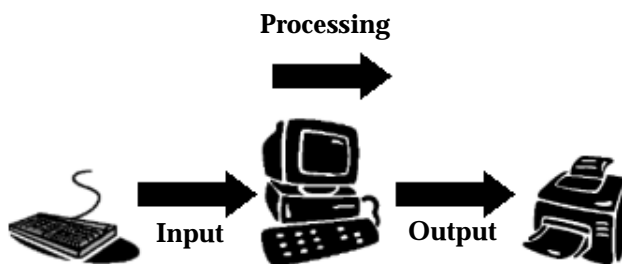
Finally, she decides that she will save 70 percent of her money (or \$175) and purchase two DVDs and four books. After the spreadsheet has done the calculations, she sees that she will have \$13 left to go to a

movie. Charlotte wants to show her work to her parents, so she prints a copy of the spreadsheet.

Processing Steps

When Charlotte was figuring out how to manage her money, she performed three basic steps:

1. **Input** She entered data into the computer.
2. **Processing** She had the computer manipulate, or process, the data.
3. **Output** The computer produced results, which Charlotte told the computer to print on paper.



Computers process input to obtain output.

These steps are used every time we process data. In order for a computer to process data, we must get the data into the computer. After the processing is done, we must get the results out. A number of different hardware devices are used for these jobs. **Hardware** is the physical components of a computer system.

Getting Data In

An **input device** is a piece of equipment used to get data into a computer so that it can be processed. Let's take a look at the input devices Charlotte used, along with some additional ones.

Keyboards

Charlotte had to enter numbers into her spreadsheet. For this job, she used her **keyboard**. The keyboard is the input device you probably use the most often. It lets us quickly and efficiently enter text and numbers.

Pointing Devices

When Charlotte was entering data into her spreadsheet, she used a mouse to move around to different locations. The mouse helped her perform other actions, such as saving and printing her spreadsheet.

Most of today's desktop computers come with a **mouse**. The mouse is a type of pointing device. It lets us point to objects on the screen. However, there are other types of pointing devices that you may encounter. One is the **trackball**. A trackball is like an upside-down mouse. Unlike a mouse, a trackball is not intended to move—it stays put on the table. There is a ball on top of the trackball. The user spins this ball with the fingertips or thumb. This action is what moves the on-screen pointer.



Some computers, especially laptops, have a small **touchpad** that replaces the mouse. You move the pointer around the screen by sliding your finger across the touchpad.

Multimedia Input Devices

Sometimes you may want to create documents that contain sound, images, and even video. This requires special input devices. For example, you can use a **microphone** to get sound (including your own voice) into the computer.

There are a number of devices designed to get images such as photos and drawings into your computer. A **scanner** transfers a printed image, such as a photo, into the computer.



You can use a **digital camera** to take pictures that can be transferred directly from the camera to the computer's hard drive. Digital cameras do not use film. Instead, the image is stored in the camera. Once the image is transferred to the computer, you can see the photo on your monitor.

Today's computers can even display video. To get video into your computer, you can use a **digital video camera**. Like a digital camera, the images stored in the video camera can be transferred into the computer and stored on its hard disk.



Some Other Input Devices

Have you ever seen a delivery person with a small handheld computer? Many of these computers have screens on which you write. The pen-like device used to write on the screen is called a **stylus**. Whatever is written or drawn appears on the screen and then is saved in the computer.

If you play video games, you are familiar with **joysticks**. They consist of a stick that can be pivoted on a base. This action lets you move objects around on the screen.

Getting Results Out

Output devices provide output in a form that we can use and understand. The most common output device is the monitor. We use **monitors** to give the computer instructions and to see processing results. Monitors create **soft copy**. Soft copy can be seen very quickly, but it is not permanent. It only lasts until something else comes on the screen.

There are times we want computer output in a form that we can save and look at later. Maybe we even want to show it to someone else. This is when **hard copy** is useful. **Printers** create hard copy. Remember that while Charlotte was working on her spreadsheet, it was displayed on the monitor. But, when she wanted a copy to show her parents, she printed the spreadsheet.

You have probably seen presentations where the speaker displayed computer output on a large screen. There are several methods of doing this. The most common is to use an LCD projection device. This device is connected to a computer. The computer's output is then projected onto a large screen. These devices are great when you want to show computer output to a large group of people.



play games or use your computer to listen to music.

Speakers also produce output—but, rather than words or pictures, they produce sound. You probably use speakers when you

Storage Devices

When the computer is working with data, it keeps this data in its memory. The memory stores data temporarily. As soon as you turn off the electricity, anything in memory is lost. To save items that we want the computer to use at a later time, we use **storage devices**.

Hard Disks and Floppy Disks

Think back to the spreadsheet that Charlotte created. When she was done, she printed the spreadsheet. She can look at this printed copy whenever she wants. But, if she wants to open the spreadsheet in the computer at a later time, she must save the spreadsheet. One common way is to save it on the computer's **hard disk**. Today's hard disks are very large. Items stored there are easy to access whenever they are needed.

However, let's say that Charlotte wants to use her spreadsheet on a friend's computer. She will want to save it on a type of storage device that she can take with her. A **floppy disk** would be a good choice. Floppy disks are inexpensive, and virtually any computer can read them. However, they can hold only a limited amount of data. For Charlotte's spreadsheet, a floppy disk would be fine. But, if you create a document with a lot of photos or drawings, it won't fit on a floppy disk.

CD-ROMs, DVDs, and More

There are other storage media that can hold much more than a floppy disk can. **Optical storage devices** use laser beams to store and read data.



We are all familiar with **CD-ROMs (compact discs-read-only memory)** and **DVDs (digital video discs)**. These hold enormous amounts of data.

The problem with CD-ROMs and DVDs is that their contents cannot be changed.

To overcome this problem, hardware manufacturers have developed **CD-ReWritable (CD-RW) disc drives**. These drives allow you to create your own CD-R or CD-RW discs. When using a **CD-R (CD-Recordable) disc**, once you write data to the disc, its contents cannot

be changed. The advantage of using a **CD-RW (CD-ReWritable) disc** is that it can be changed. You can add new items to it whenever you want. These discs are very useful when you need to use large amounts of data (such as a presentation containing graphics) on another computer. Any computer with a CD-ROM or DVD drive can read these discs.



Review Questions

1. What three input/output devices are standard equipment on nearly every computer sold?
2. List two examples of pointing devices.
3. How are storage devices different from output devices? Give two examples of each type of device.
4. What is the difference between hard copy and soft copy? When might you want to use each?
5. What advantages does a hard disk have over a floppy disk? What is a disadvantage?



What Do You Think?

1. Pretend you're an engineer, and you've been asked to design a new input device for a computer. Describe how your device would work. Think in terms of how easy it would be to use, what it would look like, what its purpose would be, and so on.
2. Now suppose you've been asked to design a new output device. What form would the output take? Describe the device using the same guidelines as in Question 1.

Glossary

CD-Recordable (CD-R) disc An optical storage disc that you can write to only one time. After that, its contents cannot be changed.

CD-ReWritable (CD-RW) disc An optical storage disc that can be written to many times. You can update its contents as necessary.

CD-ReWritable (CD-RW) disc drive An optical disc drive that lets users create discs that can be changed (overwritten) at a later time.

compact disc-read-only memory (CD-ROM) The most common type of optical storage medium. CD-ROMs can be read, but not written to.

data A general term for pieces of information, such as numbers and letters, that the computer has not yet processed.

digital camera A camera that captures and stores images as digital data, rather than using film.

digital video camera A video camera that captures and stores images as digital data, rather than using video tape.

digital video disc (DVD) A storage medium similar to a CD-ROM, but capable of storing even more data, enough for a full-length movie. DVDs can be read, but not written to.

floppy disk A removable magnetic disk that stores computer data and programs.

Also called a *diskette*.

hard copy Output that is permanent, such as text or images printed on paper.

hard disk A non-removable magnetic storage device included in most computers.

hardware The physical components of a computer system.

input Data entered into a computer so that it can be processed.

input device A hardware device used to get data into the computer so that it can be processed. Examples include a keyboard, a mouse, and a microphone.

joystick An input device that consists of a stick that pivots on a base and is used to control the movement of on-screen elements.

keyboard An input device used to enter letters, numbers, symbols, and commands into a computer.

microphone An input device used to record sound.

monitor A display screen used to provide soft copy output for users.

mouse An input device used to control an on-screen pointer by sliding the device across a flat surface, such as a desktop.

optical storage device A storage device that uses tiny laser beams to read and, depending on the type of device, write data.

output Information that is the result of computer processing.

output device A hardware device that produces results in a form that humans can understand.

printer An output device that produces a paper copy.

processing Manipulating data to get the results the user wants. Formatting a report is an example of processing.

scanner An input device that can convert text and images into digital data that can be read by a computer. Also called an *image scanner*.

soft copy Output that is temporary, such as text or images displayed on a monitor.

speaker An output device that converts electrical signals into audible sounds.

spreadsheet application An application used to create documents to manage and organize numerical data.

storage device A hardware device that stores data, processing results, and computer software so that it can be used by the computer whenever it is needed.

stylus An input device used to write directly on a special pad or on the screen of a handheld computer. Also called a *pen*.

touchpad An input device that lets you move an on-screen pointer by sliding your finger across the pad. Touchpads are used in place of a mouse on many portable computers.

trackball An input device that is similar to an upside-down mouse. The user spins the ball with the fingers or thumb.