"The Internet is the first thing that humanity has built that humanity doesn't understand, the largest experiment in anarchy that we have ever had."

– Eric Schmidt, Google CEO

Media Today

As recently as fifteen years ago, college students were unlikely to have heard of the Internet. Those who recognized the term were probably computer-engineering majors who were working on special projects with their professors. Now, a large majority of undergraduates use the Internet regularly—from various sites on campus and from home. In fact, a large majority of American homes are connected to the Internet, most with high-speed connections. And increasing numbers of people are accessing the Web through computer devices known as smart phones. Not all of these developments are the work of mass media industries (that is, industries that focus on the industrialized production and multiple distribution of messages through technological devices). As we saw in Chapter 1, when you send a computer message (electronic mail, or email) to a friend, that action is mediated interpersonal communication, much like a telephone conversation. When an organization works methodically with other organizations to reach members of the public, however, that activity is mass communication.

A great deal of mass communication activities take place on the Internet. Millions of people go to websites to watch television shows, read newspapers, download music, and do so many things that have traditionally been associated with separate non-computer media industries. Yet the Internet itself has an industrial aspect to it, with production, distribution, exhibition, and finance activities that are both different from and similar to traditional media industries. One aim of this chapter is to understand how the commercial Web is organized.

A second aim is to survey another business rooted in the digital technology: the video game industry. People play video games both on and off the Web—on their computers or on separate consoles connected to monitors. In fact, the total revenue of the U.S. video game industry exceeds $10 billion. The cash flow is not all that different from what the movies bring in at the theatrical box office in the United States. Moreover, while theatrical attendance is rather stable, the number of people playing and buying video games is growing quite strongly.

This chapter, then, examines two relatively new mass media industries that center on advances in computer technology: the *commercial aspects* of online services and the video game industry. You probably deal with these industries every day without thinking very much about how they work or how they relate to other media. Here's your chance to find out, and to think about the implications of these media for yourself, people close to you, and the society at large.

An Industry Background

The first point to make about computer-centered mass media is that the crucial difference between them and other media technologies is that they are **digital** rather than **analog.** A simple way to understand the distinction between digital and analog is to think about what distinguishes an old-fashioned vinyl record from a CD. If you look at a record, you will see grooves. When the phonograph needle moves through the grooves, it picks up vibrations that were made by the sound coming from the singer's vocal cords. When the record was made, a machine cut grooves

digital electronic technology that generates, stores, processes, and transmits data in the form of strings of 0s and 1s; each of these digits is referred to as a *bit* (and a string of bits that a computer can address individually as a group is a *byte*)

analog electronic transmission accomplished by adding signals of varying frequency or amplitude to carrier waves of a given frequency of alternating electromagnetic current. Broadcast and phone transmission have conventionally used analog technology

that reproduced these vibrations into the vinyl. The record grooves, then, hold a literal physical reproduction—an **analog**—of the singer's sound that can be reproduced with the right equipment.

The CD, by contrast, does not contain a physical reproduction of the sound. Instead, during the recording process, computers transform the singer's voice patterns into a string of binary digits, or *bits* (0s and 1s). Each sequence, or string, of 0s and 1s represents a different sound. The strings serve as a code—a symbolic representation of the sound. This digital code is placed on the CD in an order that conforms to the sequence of sounds made by the singer. When you turn on your CD player, a laser beam reads the code and sends it to a computer chip in the player. The computer chip is programmed to recognize the code and to understand which strings of numbers represent which sounds. At the speed of light, the chip transforms the code into electrical impulses that, when sent through an amplifier and sound system, end up reproducing the singer's voice.

The basic idea applies, too, to digital music files that reside in your computer, digital music player, or mobile phone. In that case, you don't even have a piece of plastic that carries the tune into the device. Rather, you download a digital file in one of a number of formats (MP3, WAV, AAC, or others), and if your device has the ability to recognize and decode the file, it transforms it into sounds that reproduce the original. If the file you are using is not copy-protected (and MP3 and WAV files are not) you can copy the music from your phone to one of your other players. Being able to move digital files (music or not) from one device to another is an example of the **convergence** of media technologies—the ability of different media to interact with one another easily in parallel digital formats. Convergence also means that different media can end up carrying out similar functions because they all accept digital information. So, for example, a computer can take on the functions of a DVD player, a CD player, and a cable television set.

convergence the ability of different media to interact with each other easily because they all deal with information in the same digital form

Just as important, the application of computer codes to mass media materials allows audience members to manipulate the materials to suit their interests. Audience members who are connected to the producers of an audio or audiovisual program via a cable or telephone line can respond to those producers via the com-

An iPhone or a laptop that can take on the functions of multiple devices—a telephone, DVD player, a CD player, and more—are just two examples of media convergence. Think about the digital devices that you use everyday. Do they combine technologies that were traditionally separate?

One of the earliest computers weighed nearly 30 tons, but today's computer technology can be found in countless lightweight, handheld devices.

puter. The producers, in turn, can send out a new message that takes the response into consideration. This sort of manipulation and response, which is much easier in digital than in analog technology, is what people mean when they speak of **interactivity.** We are leaving the analog age, they point out, and entering the age of digital interactive media.

interactivity the ability to track and respond to any actions triggered by the end user, in order to cultivate a rapport

The Rise of Computers and the Internet

The roots of digital interactive media can be traced at least as far back as a primitive computing machine that French mathematician Blaise Pascal built in the 1600s. Around the same time, German mathematician Gottfried Leibnitz set out important theoretical principles for the use of **binary digits,** the zero-to-one system that is at the core of digital technology. Morse Code—the dot-dash system devised by American inventor Samuel Morse when he created the telegraph in the

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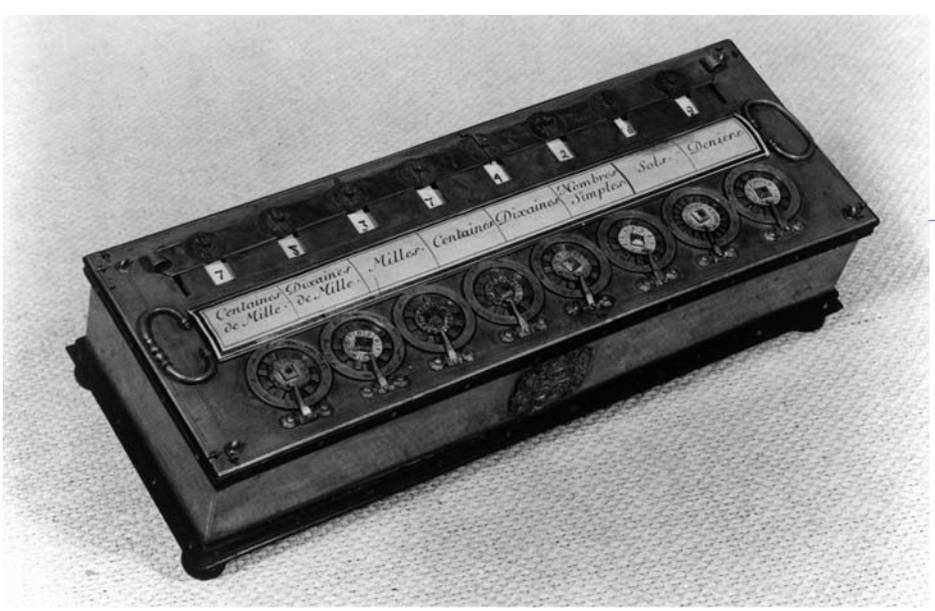
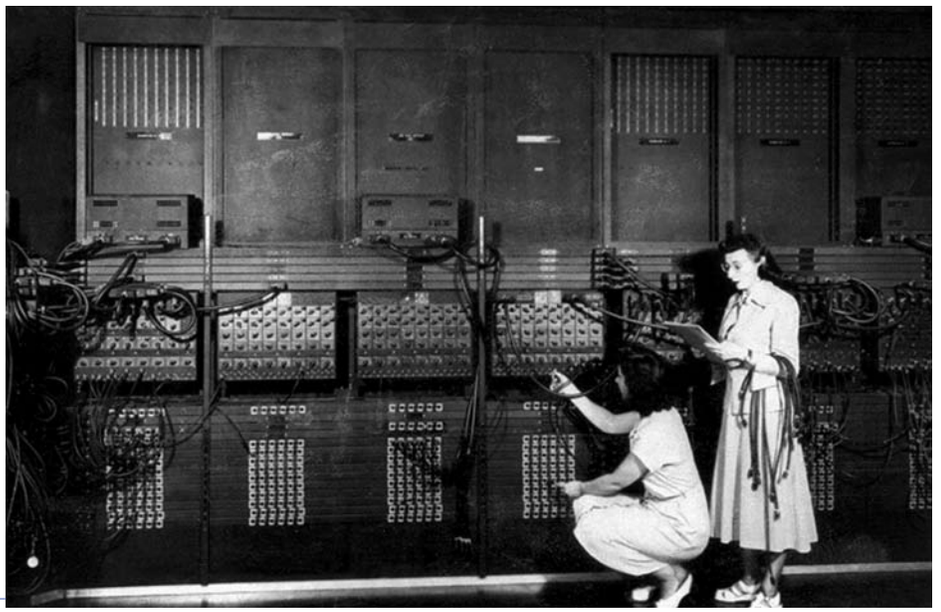


This mechanical adding machine, built by French philosopher and mathematician Blaise Pascal in 1642, was the first digital calculator. His design may not have been commercially successful, but it did lay the groundwork for today's computer engineering.



The Electronic Numerical Integrator and Computer (ENIAC) was so big that it took up an entire room. The two women in this 1946 photograph are programming the computer by adjusting its wiring. These women and four others—Kay McNulty, Betty Jennings, Betty Snyder, Marlyn Wescoff, Fran Bilas, and Ruth Lichterman—hired to run ENIAC were the first computer programmers in history.

1840s was an important example of the use of a binary code to represent letters in the English alphabet. It wasn't until a hundred years later, though, that scientists figured out how to build a machine that could use binary digits to perform much more complex manipulations of mathematical data.

In 1940, at Harvard University, mathematician Howard Aikin constructed a computer that used the binary system to calculate; it used open and closed mechanical gates to represent binary digits. The machine was huge and noisy. A profound advance came in the mid-1940s when electrical engineers at the University of Pennsylvania replaced the mechanical gates with electronic "gates" in the form of vacuum tubes. These engineers constructed **ENIAC** (Electric Numerical Integrator and Computer), as this machine was called, to help the U.S. military figure out the trajectory of missiles in flight. Like the Harvard machine, ENIAC was very big. It took up a large room, weighed thirty tons, and used about eighteen thousand tubes.

What was brilliant about ENIAC, though, was its use of electronic rather than mechanical components as the basis of its operation. The usefulness of this thinking was confirmed in the 1950s, when scientists at Bell Labs invented the **transistor,** which featured the same capabilities as the vacuum tube in a smaller package. Private firms began to turn out computers, and over the next couple of decades, these computers got smaller and simultaneously faster and more powerful. By the 1970s, inventors had created the **microprocessor,** a miniaturized version of the central processing unit (the "brains") of a computer on a single chip. The microprocessor made it possible to build complex calculators and video games. As early as 1975, the Midway arcade company sold a Japanese home-arcade game cartridge called Gunfight that relied on a computer microprocessor for displaying its images.

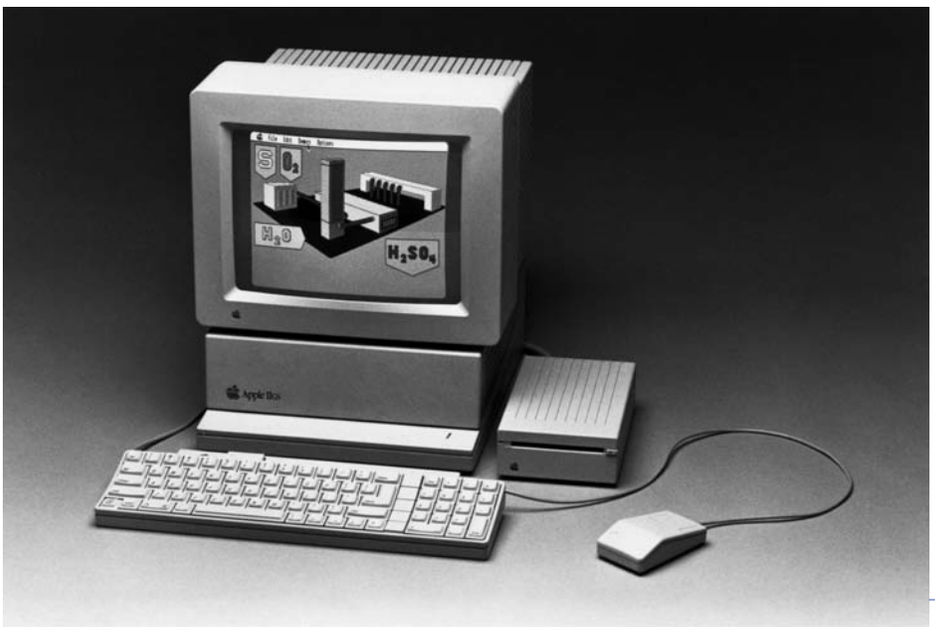
ENIAC or Electric Numerical Integrator and Computer the world's first operational electronic digital computer

transistor a device that amplifies current and regulates its flow, acting as a switch or gate for electronic signals

microprocessor a miniaturized version of the central processing unit (the "brains") of a computer processor on a single microchip (sometimes called a *logic chip*); designed to perform arithmetic and logic operations that make use of small number-holding areas called *registers*. Typical microprocessor operations include adding, subtracting, comparing two numbers, and fetching numbers from one area to another

The Advent of the Personal Computer

The invention of the microprocessor also led to the creation of the personal computer (PC), a computer that could fit on a desk. The first people to use PCs were hobbyists who built PCs from kits. By the early 1980s, Apple Computer, Commodore Corporation, Tandy Corporation, Osborne, and IBM were building fully assembled PCs for home as well as business use. An entire industry developed



Personal computers like the Apple II GS seen here began to find their way into homes and businesses in record numbers in the 1980s. *Time* magazine named the personal computer its "Person of the Year" for 1982. In 2006 *Time* would return to computers again for its "Person of the Year", this time honoring "You," the anonymous online contributors to blogs and sites like Wikipedia and YouTube.

rather quickly to create programs that could get personal computers to do useful things for people. Software companies marketed word processing programs that made the computer function like a super typewriter. Spreadsheet programs helped companies calculate projected expenditures and earnings. Educational programs helped kids do schoolwork. Computer games helped people have fun and persuaded them to buy computers in the first place. Just as surely as network television programs did, these computer programs involved mass communication. Over the next decade, in fact, executives in the television industry began to worry that the computer software industry was luring audiences away from their traditional TV sets.

Online Capability

The typical 1980s-vintage personal computer that sat in a home office consisted of a video display, a keyboard, a microprocessing unit, and a storage device (a replaceable, or "floppy," disk drive and often a permanent, or "hard," drive). What the earliest home-based computers generally didn't have was a way to send messages to computers elsewhere in the world. Before too long, however, computers did come equipped with the ability to go online—to receive digital information from anywhere by telephone. The hardware that made online activity possible is the **modem,** a device attached to the computer that performs a digital-to-analog conversion of data and then transmits the data to another modem. That modem reverses the process, performing an analog-to-digital conversion that permits the computer to which it is attached to use the data (see Figure 14.1).

modem a device attached to the computer that performs a digital-to-analog conversion of data and then transmits the data to another modem, which reverses the process

An entire industry developed around the use of the modem. Commercial online networks, such as Prodigy and America Online, aggressively offered consumers the ability to play games with people across the nation, get help with homework through online encyclopedias, and chat with people about common interests. By the mid-1990s these firms came into competition with an enormous online network that threatened to push them aside: the **Internet.**

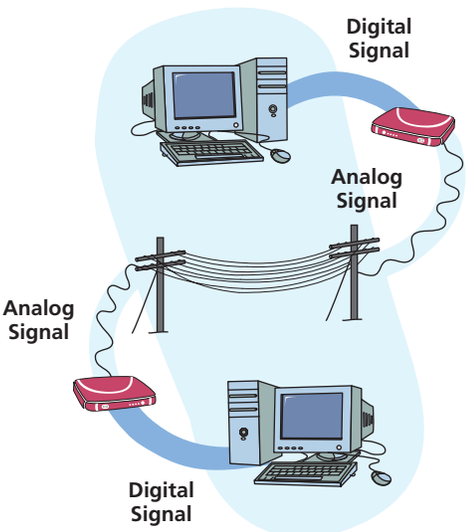
Internet a worldwide system of computer networks; a network of networks in which users at any one computer can, if they have permission, get information from any other computer (and sometimes talk directly to users at other computers)

The Internet was developed by the National Science Foundation (NSF) from a project started by the U.S. Department of Defense. ARPANet, as it was first known,

Figure 14.1

How a Modem Works

A voiceband modem—short for modulator-demodulator—allows computers to "talk" to one another over great distances by modulating, or converting, the digital computer signals into sounds that can be transmitted over telephone lines. A modem on the other end then demodulates the signal—that is, it converts the analog sounds back into digital information that can be understood by another computer. Today, cable and DSL modems are more commonly used as faster connections between computers, and unlike voiceband modems, they do not need to modulate or demodulate the digital signals that they transmit.

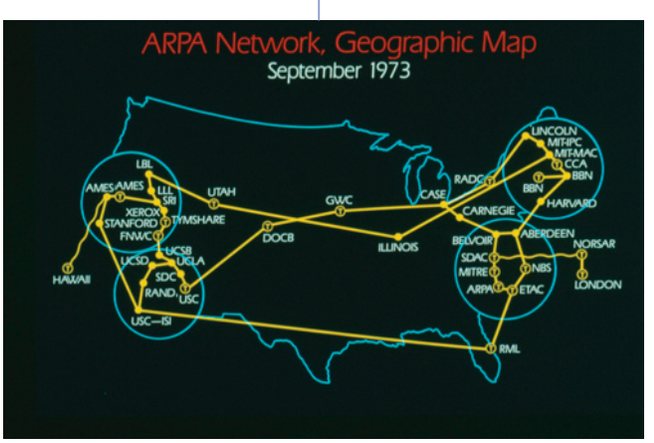


hyperlinks highlighted words or pictures on the Internet that, when clicked, will connect the user to a particular file, even to a specific relevant part of a document

was conceived by the Advanced Research Projects Agency (ARPA) of the Department of Defense in 1969 to create a network that would allow users of a research computer at one university to "talk to" research computers at other universities. A side benefit of ARPANet's design was that, because messages could be routed or rerouted in more than one direction, the network could continue to function even if parts of it were destroyed in the event of a military attack or other disaster. At its core were three parts: a computer code (software) that allowed messages to be addressed and sent to particular individuals, a series of interconnecting computer networks that could coordinate the transmission of these messages around the nation and even around the world, and modem hardware that made it possible to use regular analog telephone lines to send digital computer messages.

Although the network was initially meant for scientific use, non-scientists within universities and executives from companies outside universities saw linking their computers to this network as a new and speedy way to communicate with others around the world. Universities and private firms spent huge sums of money to purchase computers and make sure that they could handle the rush of Internet traffic. The research, education, and business benefits that accrued through the Internet, though, would have cost much more if the work had been done in other ways—through travel or regular phone calls, for example.

The earliest form of the Internet was developed in 1969 by Advanced Research Projects Agency (ARPA) of the Department of Defense and it was first known as the ARPANet. As this map from 1973 shows, the network allowed users of research computers at distant locations to communicate with one another.



The Hyperlink and the World Wide Web

But some computer scientists had even more ambitious ideas. They did not want the Internet to be a vehicle for simply transferring messages or documents between individuals. Instead they wanted to create a way for large groups of people to access and work on the same files. And they wanted to be able to send people to those documents through **hyperlinks**—highlighted words or pictures that, when clicked, will connect the user to a particular file, even to a specific

relevant part of a document. Researchers at CERN, a nuclear research center in Geneva, Switzerland made this possible in 1989. Tim Berners-Lee and Sam Walker from the United Kingdom and Robert Cailliau from Belgium created **HTML** (HyperText Markup Language)—a computer language system that allowed people to access a system of interlinked documents that could be accessed through the Internet. HTML is used to define the structure, content and layout of a web page by using what are called *tags* that have attributes. As the viewer of a web page you don't see the HTML; it is hidden from your view. However, you do see the results. A key aspect of this system—what they called the World Wide Web—was that users could go to the materials by typing in a specific World Wide Web address or a clicking on a link in a document that contained the address which would automatically "link" them to that place.

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Internet messages had to be transmitted in text form. Sending graphical images was possible, but the images had to be decoded by the receiver before viewing. That situation changed in 1993, when computer scientists at the University of Illinois created the **browser**, a graphical way to access the World Wide Web**.** Using software like Netscape Navigator or Microsoft Internet Explorer, a computer user can easily view complex drawings or photographs. As computer experts devised increasingly sophisticated and easy-to-use browsers for finding information, students and their professors began to "surf" the Web. The idea that millions of well-educated people around the world could access pictures, sound, and even video intrigued marketers and media firms. They started websites and tried to entice potential customers to visit them.

browser software that interprets Hypertext Markup Language (HTML) and displays it on a computer screen

By the mid-1990s, the Internet had moved far beyond its original military and academic purpose to become a vast communication system. Much of the activity in **cyberspace** (that is, in the online world of computer networks) still involved mediated interpersonal communication—individuals interacting one-on-one with other individuals through written words, voice, and video. But a large and growing portion of the online world involved commercial attempts to reach out to various audiences. Companies sprang up to create sites on the Web or the commercial online networks, to determine who was coming to these sites, and to encourage advertising on them. The digital world of the Internet, in short, had become a new mass medium.

cyberspace the online world of computer networks

The Rise of Video Games

The period from the 1940s through the 1990s is also roughly the period in which the video games developed to become a mainstay in many American homes.[1] The birth of video games can be traced back to two separate streams of developments that initially were unrelated to the computer. The first stream involved the **pinball machine**, a coin operated game in which a player scores points by causing metal balls to move in certain directions (often with flippers) inside a glass covered case. These games were made popular by David Gottlieb beginning in the early 1930s at **entertainment arcades**—commercial locations featuring coin-operated machines such as pinball machines, fortune tellers, and shooter games.

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While the mechanical pinball game was a fixture of arcades, scientists working on video electronics and computers were amusing themselves with games that could be played on TV-like displays. In 1958, for example, scientists at the Brookhaven National Laboratory set up a video tennis game on an oscilloscope for play during its annual visitors' day. Similarly, computer students at MIT, Stanford