

The digital revolution has changed the way we make goods and provide services, transforming virtually every industry and creating whole new categories of products and businesses — all at breathtaking speed. Simply keeping track of what is happening, let alone comprehending it, often seems an overwhelming task.

This Eighth Edition of *The Digital Economy Fact Book* is dedicated to providing a factual basis from which analysis of the digital economy can begin. It seeks to sort out the myths from the realities, the hyperbolic hopes from the sober projections. In seven key sections, it presents the best available information on:

- The Growth of the Internet
- The Hardware Sector
- The Communications Sector
- Digital Media
- Electronic Commerce
- Threats to the Digital Economy
- The Digital Economy

In each section, the authors present the best and most recent historical data, along with projections from the leading research firms, on topics like Broadband Adoption, Internet Video, Venture-Capital Investments in the IT Sector, Identity Theft, and the contribution of the IT Sector to Economic Growth.

This edition also includes a timeline of key events affecting the digital economy during 2005-2006.

The Digital Economy Fact Book is a must-have reference source for anyone interested in the changes happening in today's fast-moving economy.

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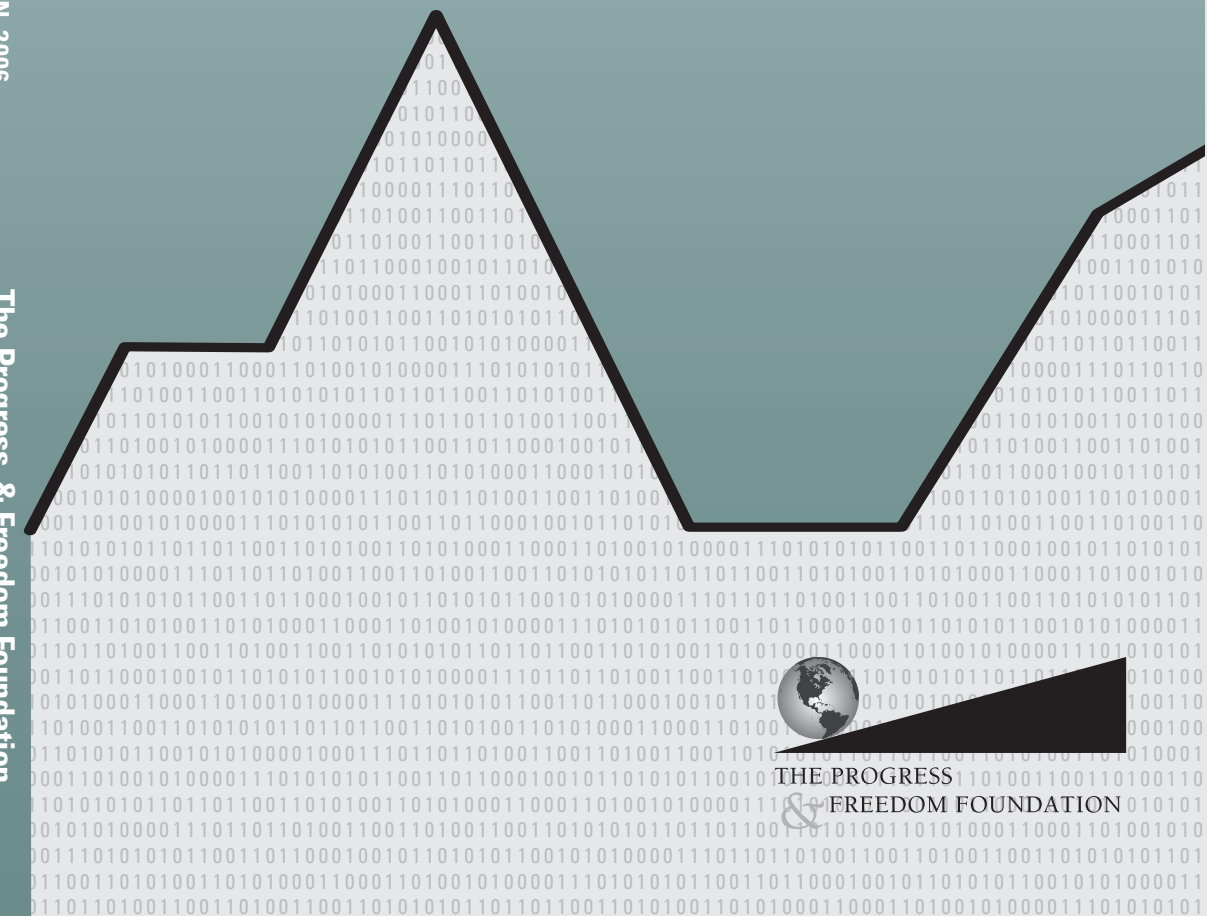
The Digital Economy Fact Book EIGHTH EDITION, 2006

The Progress & Freedom Foundation

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Thomas M. Lenard
Daniel B. Britton



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The Progress & Freedom Foundation is a market-oriented think tank that promotes innovative policies for the digital age. Dedicated to principles of individual liberty, it conducts research on the impact of technological change on the marketplace and the resulting implications for public policy, and disseminates the results of its work through books, studies, seminars, conferences and electronic media of all forms. Established in 1993, the Foundation is a private, non-profit, non-partisan organization supported by tax-deductible donations from corporations, foundations and individuals. It does not engage in lobbying or take positions on legislation. The views expressed here are those of the authors, and do not necessarily represent the views of the Foundation, its Board of Directors, officers or staff.

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Foreword

PFF proudly offers this Eighth Edition of *The Digital Economy Fact Book*. This volume chronicles the digital revolution's transformation of the economic, social, cultural, and political landscape of both the United States and the world. It shows that the digital economy remains vibrant, that competition is on the rise, and that innovation promises further wonders yet to come.

The Fact Book has turned into something of a kinetoscope for the digital economy. Kinetoscopes, those primitive forbears of the movie projectors, gave a herky-jerky sense of motion, with little fluidity. In today's parlance, there was high latency and low bandwidth. So it is also with this volume—the sheer mass of information and breadth of the digital economy make the supreme challenge here one of editing. Likewise, during the time between these annual volumes, big changes occur and innumerable events happen that we can barely touch on. All the same, the *DEFB* represents a valuable overview of what has gone on in the digital arena.

If last year was “the year of Google,” then this year has a number of candidates. It could have been the year of, take your pick: “the communications merger,” “net neutrality,” “the Long Tail,” “the blog,” “the franchise wars,” or “the RIM patent case.” A host of digital policy issues percolated. The *eBay vs. Merc Exchange* case clarified that equitable principles do apply to a patent infringement injunction. The U.S. warded off attempts to turn over Internet governance to a multi-lateral body like the U.N. And “net neutrality,” a once arcane bit of rentseeking against broadband service providers, went supernova, and entered the mainstream political debate.

To be sure, none of these policy issues are over. Yet, at the same time, the digital economy remains dynamic and vibrant—almost as if the policy battles in Washington, Brussels, and elsewhere mean little to the innovators, entrepreneurs, and venture capitalists that fuel the incredible economic productivity growth brought about because of information technology.

Then again, also entering the public mind this last year were concerns about the darker sides of the Internet and the connectivity it brings. From civil libertarians up-in-arms about government monitoring of communications, to parents' concerns about predators, or just plain unseemly private revelations on MySpace.com, we are always reminded that the digital transformation does not erase the baser instincts of human nature or the delicate traditions that preserve liberty.

This volume is the work of a dedicated crew of researchers, led by our Senior Vice President for Research, Tom Lenard. The main credit for work on this volume goes to Dan Britton, a talented young economist, who was in turn aided by Joseph Adamson, Eileen Goulding, Stephen Lareau, and Marie Ryan. To them, the readers owe their thanks for this volume. To you, we owe our gratitude for taking interest in our work here at PFF.

Ray Gifford
President

The Progress & Freedom Foundation
July 21, 2006

Chapter 1

The Growth of the Internet

The main driver of the digital economy is the Internet. The Internet is becoming not only a global marketplace, but also a means to communicate and distribute information more efficiently and to larger audiences than ever before. As more people go online worldwide, the number of potential consumers increases, and so does the efficiency of innovators and producers. In 1995, 34 percent of all Internet users were outside North America; in 2005, the figure was 77 percent,¹ which bodes well for the viability of the Internet as a worldwide forum. The borders that once constrained information and technological progress are being torn down by this new means of communication.

The digital economy experienced serious setbacks at the beginning of the twenty-first century. Starting in late 1999, the bursting of the Internet stock market bubble, coupled with a virtual meltdown in the telecom sector, brought financial difficulties and corporate scandals. Nevertheless, the expansion of Internet use proceeded without interruption. Consumer and public confidence in the Internet and telecom sectors has been maintained, fostering renewed growth and expansion.

The Internet is increasingly integrated into the daily routines of households and businesses throughout America and the rest of the world. By all measures, a majority of adult Americans are now online, and increasing numbers have access to broadband connections. Overall, users are employing the Internet for longer periods and pursuing an expanded range of personal and commercial activities.

The past ten years have seen a slowdown in the growth rate of the percentage of U.S. adults who go online. There are some Americans who, for a variety of possible reasons, don't find it worth the necessary investment to use the Internet. Growth rates in the rest of the world, however, are still high, as the pent-up demand for Internet access is satisfied by improvements in technology that make it easier and cheaper to go online.

In the past, the media was controlled by large companies, with news and entertainment originating by necessity from the few who had the means to distribute it. But now, individuals who go online are becoming the sources of information and entertainment as well as the recipients.² This presents a challenge and an opportunity for the digital economy.

History of the Internet

The spark that led to the creation of what is now called the Internet was the USSR's launch of *Sputnik*, the first artificial earth satellite, in 1958. The perceived possibility of Soviet technological superiority motivated the U.S. to create the Advanced Research Projects Agency (ARPA) within the Department of Defense, with the goal of expanding the American technological base as well as improving the scope and quality of communications. The network of connected computers, ARPANET, created by this agency evolved into the Internet over several decades.

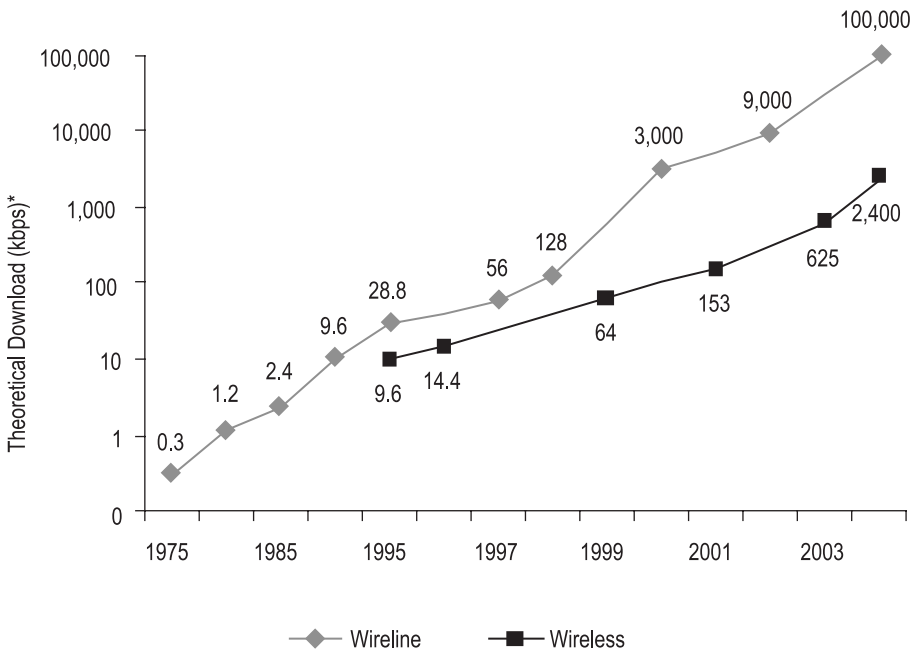
- Of the many devices created in the early 20th century, it is difficult to point to one as the “first computer.” However, the Electronic Numerical Integrator and Computer (ENIAC), completed in 1945, marked a significant technological step forward. It functioned until 1955, and during those ten years was thought to have performed more calculations than all of humanity up to that time.³
- The second ingredient to ARPANET was the idea of an interconnected network. Vannevar Bush, a government engineer who contributed to the development of the atomic bomb and cofounded Raytheon, had envisioned “a sort of mechanized private file and library... a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility.”⁴ The ARPANET, developed from 1962 to 1969 and continually improved upon thereafter, was in effect a real version of sociologist Marshall McLuhan’s concept of an electronic global village, achieving Bush’s vision of the future of information retrieval with the raw power of computers.⁵
- The first cross-country ARPANET communications line was installed in 1970 by AT&T between UCLA and BBN Technologies, a high-tech company in Massachusetts, and was capable of transmitting information at the then-incredible speed of 56 kilobits per second. By 1973, there were approximately 2,000 ARPANET users, mostly at U.S. government agencies and universities, with email taking up 75 percent of all traffic.⁶
- Several other networks were developed during the 1970s and 1980s, including NSFNet, developed by the National Science Foundation. As NSFNet merged with ARPANET, the term “Internet” (short for “interconnected network”) was increasingly used to describe the burgeoning network.⁷
- After enough networks had merged, in 1990 the name “ARPANET” was no longer applicable to a single network, and a year later the World Wide Web was introduced. In the first few years after the graphical Internet browser Mosaic was introduced in 1993, World Wide Web traffic grew at over 300,000 percent per year.⁸

Computer Characteristics, 1946 vs. 2006

	Electronic Numerical Integrator and Computer	Intel Core Duo Chip
Debut	1946	2006
Performance	5,000 addition problems/sec	21.6 billion operations/sec
Power Use	170,000 watts	31 watts max
Weight	28 tons	Negligible
Size	80' w x 8' h	90.3 sq. mm.
What's Inside	17,840 vacuum tubes	151.6 million transistors
Cost	\$487,000	\$637

Source: CNet⁹

Data Transfer Rates



* Theoretical download refers to the maximum speed at which data is transferred.

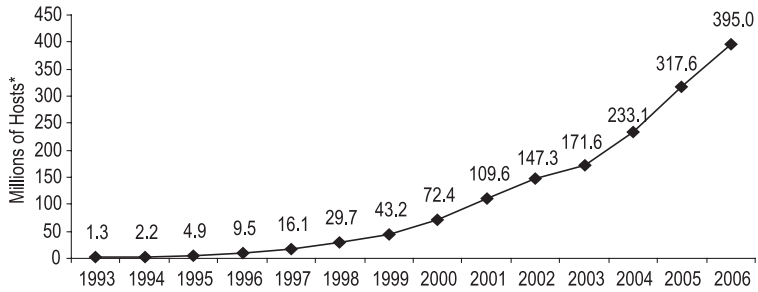
Source: Morgan Stanley¹⁰

Host Computers and Domains

The number of host computers connected to the Internet is a good indicator of the scope and total usage of the Internet. A host computer is one or more networked computers that gives information such as web pages to users.¹¹ The first host computer on the Internet was installed at UCLA in the fall of 1969. When the current TCP/IP standard was adopted in 1983, there were approximately 300 hosts connected to the Internet. The Domain Name System was introduced in 1984, and in 1985, Symbolics.com became the first registered domain.¹² By 1993, the number of hosts connected to the Internet had grown to 2 million. After the 1993 release of Mosaic, the first graphical web browser, the number of hosts grew at an average rate of about 50 percent per year from 1994 to 2006.¹³

- The number of host computers connected to the Internet continued to grow rapidly in 2005, reaching approximately 395 million by January 2006, a 24-percent year-over-year increase. This growth rate was smaller than previous years; 2003 and 2004 each had growth rates of approximately 36 percent.¹⁴
- *The CIA World Factbook* monitors the number of Internet hosts in every country. The United States ranks first, with 195,138,696, followed by the European Union countries with 22,000,414, and Japan with 21,304,292. India is in 29th place with 787,543, and China is in 43rd place with 187,508.¹⁵
- A top-level domain (TLD) is the last part of an Internet domain name. There are two main types of TLDs: country code top-level domains (ccTLDs) such as *.fr* for France, and generic top-level domains (gTLDs) such as *.com* and *.org*.¹⁶
- Domain registrars are becoming more competitive. In 2005, the leading domain registrar was GoDaddy.com, with 9,266,628 total domains, followed by Network Solutions, with 6,719,707. In 2005, there were 287 other registrars with at least 1,000 domains each.¹⁷
- The market for domain names is growing and becoming more active. As of early 2006, in the course of one day, an average of 170,000 domain names are transferred or deleted in the *.com* and *.net* registries.¹⁸ From mid-2004 to mid-2005, the market for domain names grew 28 percent.¹⁹

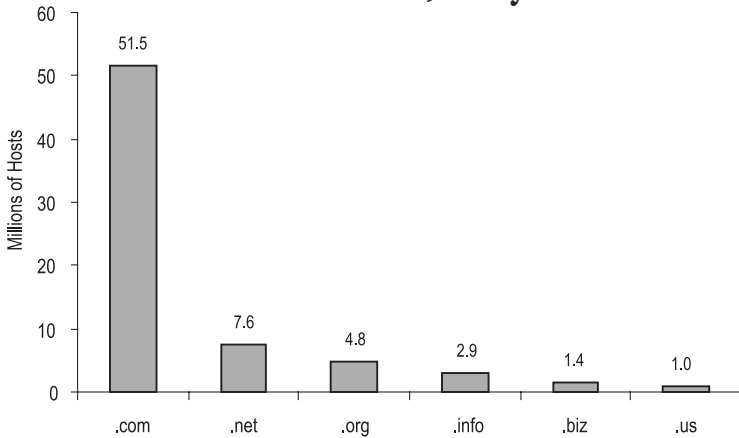
Number of Hosts on the Internet



* Data from January of each year.

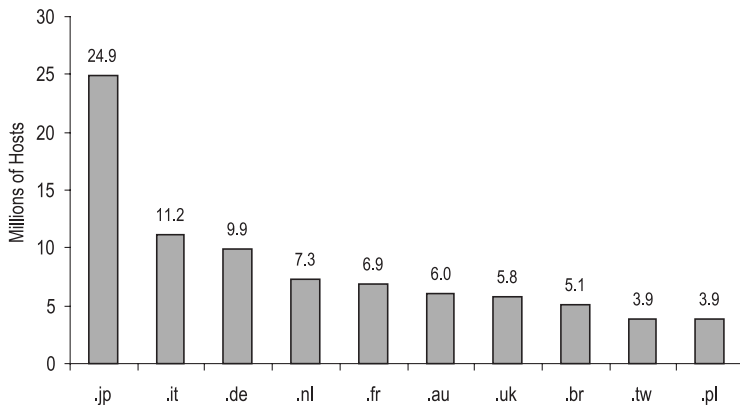
Source: Internet Systems Consortium²⁰

Domain Counts, May 2006



Source: Domain Tools²¹

Top Ten ccTLD Names, January 2006



Source: Internet Systems Consortium²²

The U.S. Online Population

The percentage of American adults who go online is increasing, but a plateau may have been reached. According to the Pew Internet & American Life Project surveys, the percentage of U.S. adults who ever go online reached about 73 percent in April 2006. This represents an increase of only 10 percentage points since April 2002, making for a much slower yearly growth rate than during the 1995-2002 period, when the percent of U.S. adults who go online increased from about 15 percent to roughly 60 percent.²³

- A study by Parks Associates found that the percent of U.S. households willing to subscribe to Internet services will only increase from 63 percent to 64 percent in the course of 2006. Of the 39 million homes without Internet access, only 8 million have a computer, and many of these 8 million are unlikely to subscribe to an Internet service even at very low costs.²⁴
- According to JupiterResearch, the average online consumer spends as much time online as s/he spends watching TV—14 hours per week.²⁵
- Thirty percent of Internet users go online on any given day to pass the time, without any particular reason.²⁶
- The most important determinant of whether a person uses the Internet is educational attainment. Sex, age, race, income, and community type (rural vs. urban) are less important.²⁷

Percent of U.S. Online Adults Engaging in Activities, by Age, December 2005

Activities	Age							All Online Adults
	(12-17)	(18-28)	(29-40)	(41-50)	(51-59)	(60-69)	(70+)	
Use Email	89	88	92	90	94	90	89	91
Get Health Info	n/a	73	84	80	84	68	72	79
Product Research	n/a	79	80	83	79	74	60	78
Get News	76	72	76	75	70	74	68	73
Online Purchase	43	68	69	68	67	65	41	67
Travel Reservations	n/a	50	72	64	64	59	60	63
School Research	n/a	73	60	61	48	33	14	57
Use Government Sites	n/a	41	56	64	60	55	45	54
Job Research	n/a	44	59	59	54	31	13	51
Instant Message	75	66	52	38	42	33	25	47
Get Info about a School	57	59	42	50	40	30	14	45
Job Hunting	30	62	51	40	36	17	2	44
Bank Online	n/a	38	50	44	37	35	22	41
Online Games	81	54	37	29	25	25	32	36
Text Message	n/a	60	44	29	15	11	8	35
Use a Photo Service	n/a	39	38	31	32	31	30	34
Religious Info	26	30	38	24	28	28	28	30
Rate a Person or Product	n/a	36	34	27	31	24	8	30
Read Blogs	38	41	30	20	21	19	16	27
Search for a Person	n/a	31	31	23	23	24	29	27
Download Music	51	45	28	16	14	8	5	25
Participate in Online Auction	n/a	26	29	25	20	18	6	24
Download Video	31	27	22	14	8	8	1	18
Create a Blog	19	20	9	3	9	3	4	9

Source: Pew Internet & American Life Project²⁸

Percent of Groups Who Use the Internet in the U.S., April 2006

Gender		Age		Race/Ethnicity		Community Type	
Men	74	18-29	88	White	73	Urban	75
Women	71	30-49	84	Black	61	Suburban	75
Total Adults	73	50-64	71	Hispanic	76	Rural	63
		65+	32				
Household Income				Education			
		Less than \$30,000/yr.	53			Less than High School	40
		\$30,000-\$49,999	80			High School	64
		\$50,000-\$74,999	86			Some College	84
		\$75,000+	91			College Degree or More	91

Source: Pew Internet & American Life Project²⁹

The Worldwide Online Population

According to the *Computer Industry Almanac*, the total number of worldwide Internet users passed one billion in 2005 and is estimated to reach two billion by 2011. In spite of the slowdown in the growth rate of new American Internet users, there is no global plateau yet in sight. Since the number of worldwide Internet users was 420 million in 2000, this means that the number of global Internet users has been doubling and is expected to continue doubling roughly every five years in the first decade of the 21st century.³⁰

- Most of the growth in Internet users comes from developing countries; the markets in the United States, Europe, Japan, and Australia are much closer to being saturated and thus tend to have slower rates of increase.³¹
- The variable “total Internet users” can be regarded as dealing with the “width” of Internet usage, but it doesn’t give as much information about the extent to which the Internet is being used by those individuals—the “depth” of Internet usage. Ranking countries by average monthly hours spent online per unique user gives a very different picture. comScore estimated that, excluding traffic from public computers, Israel, Finland, and South Korea rank highest, with 57.5, 49.3, and 47.2 hours, respectively. Interestingly, the U.S., the U.K., and Japan were not in the top 15.³²
- Morgan Stanley estimated Internet penetration rates for 15 countries and found that developed countries (the U.S., Australia, and countries in Europe and East Asia) had penetration rates of around 40 to 70 percent, while five of the 15 countries with the most Internet users in 2004 had Internet penetration rates less than 20 percent: China (7 percent), India (4 percent), Russia (16 percent), Brazil (10 percent), and Mexico (12 percent).³³ These five countries are likely to see their penetration rates increase faster than those of the developed world.
- The G8 countries, where about 15 percent of the world’s population resides, have almost 50 percent of the world’s total Internet users.³⁴
- The 50 countries in Africa have a total number of Internet users less than that of France,³⁵ which has about 25 million Internet users.³⁶
- There are about 30 countries in the world with an Internet penetration rate of less than 1 percent.³⁷

Top Ten Countries by Number of Internet Users, Year-End 2005

Country	Internet Users (millions)	Percent of Total User Base
USA	197.8	18.3
China	119.5	11.1
Japan	86.3	8.0
India	50.6	4.7
Germany	46.3	4.3
UK	35.8	3.3
South Korea	33.9	3.1
Italy	28.8	2.7
France	28.8	2.7
Brazil	25.9	2.4

Source: Computer Industry Almanac³⁸

World Internet Usage, 2006

Region	Internet Users (millions)	Percent of Population	Percent of World Users	Growth, 2000-2005 (% change)
Asia	364.3	9.9	35.6	218.7
Europe	291.6	36.1	28.5	177.5
North America	227.3	68.6	22.2	110.3
Latin America	80.0	14.4	7.8	342.5
Africa	23.6	2.6	2.3	423.9
Middle East	18.2	9.6	1.8	454.2
Oceania/Australia	17.9	52.6	1.7	134.6
Total	1,022.9	15.7	100.0	183.4

Source: Internet World Stats³⁹

Top Languages Used on the Internet, 2006

Language	Internet Users (millions)	Percent of World Users	Growth, 2000-2005 (% change)
English	312.8	30.6	128.0
Chinese	132.3	13.0	309.6
Japanese	86.3	8.5	83.3
Spanish	80.6	7.9	229.2
German	56.9	5.6	106.0
French	41.0	4.0	235.9
Korean	33.9	3.3	78.0
Portuguese	32.4	3.2	327.3
Italian	28.9	2.8	118.7
Russian	23.7	2.3	664.5
Top Ten Languages	828.6	81.0	156.0
Rest of World	194.2	19.0	421.6
World Total	1,022.9	100.0	183.4

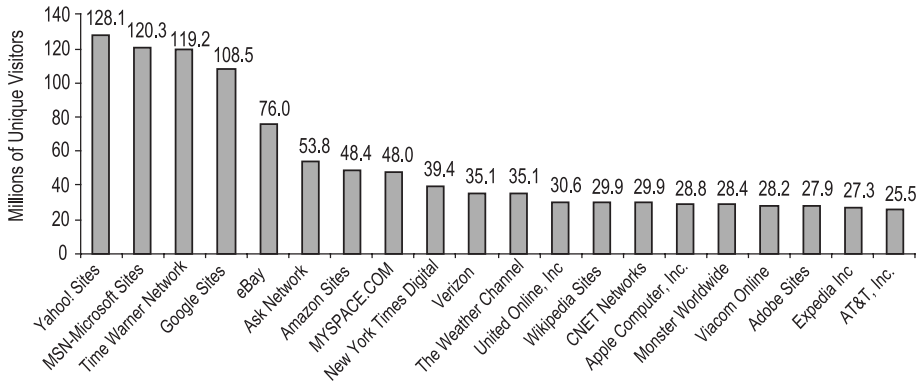
Source: Internet World Stats⁴⁰

Websites on the Internet

Netcraft estimates that as of April 2006 there were more than 80 million websites on the Internet, which represents a doubling of the number of websites since April 2003.⁴¹

- In March 2006, 43 percent of Internet searches were performed on Google (up from 36 percent in March 2005), 28 percent on Yahoo! (down from 31 percent in March 2005), 13 percent on MSN (down from 17 percent in March 2005), 8 percent on the Time Warner Network (down from 9 percent in March 2005), and 6 percent on Ask Jeeves/Ask (unchanged since March 2005).⁴²
- In terms of click-throughs (the number of times users actually click on a search result), Google dominates the search market, with 64 percent of search engine click-throughs in January 2006. The closest followers were Yahoo! with 10 percent, and AOL with 9 percent.⁴³
- BitTorrent, a peer-to-peer file distribution application, accounted for 35 percent of all Internet traffic in 2004.⁴⁴
- Traffic to video-oriented sites exhibited significant growth in 2005. In February 2006, MSN Video had 9.3 million unique visitors, a 44-percent increase over the previous year. The new sites YouTube and Google Video attracted 9.0 and 6.2 million unique visitors, respectively.⁴⁵
- Wikipedia is one of the most notable growing websites of the past year and is leading the pack of educational reference sites, which as a whole grew 22 percent from September 2004 to September 2005 and reached 31 percent of active Internet users at the end of that period.⁴⁶
- Social networking sites (“the reality television of the Internet”) have grown enormously. In April 2006, the ten most popular social networking sites collectively attracted 68.8 million users in the U.S. (45 percent of the total number of active web users in the U.S.), an increase of 47 percent from April 2005.⁴⁷ Ranked by number of unique visitors, the top five were MySpace (38.4 million), Blogger (18.5 million), Classmates Online (12.9 million), YouTube (12.5 million), and MSN Groups (10.6 million).⁴⁸
- Classified websites saw their numbers of monthly unique visitors increase 80 percent from September 2004 to September 2005, when 22 percent of online adults used classified websites. The top sites were Craigslist.org, with 8.8 million unique visitors in September 2005 (a 156-percent year-over-year increase) and Trader Publishing Company, with 8.2 million unique visitors (a 90-percent year-over-year increase).⁴⁹

Most Visited Web Properties, April 2006



Source: comScore⁵⁰

Emerging Internet Companies

Company	Market	Data Points
BitTorrent	P2P File Sharing	35% of all Internet Traffic in 2004
YouTube	Online Video Content	11,000,000 Unique Visitors (1/06) vs. 327,000 (8/05)
Cafepress.com	Online Marketplace	10,000,000 Unique Visitors (1/06) vs. 6,000,000 (7/05)
Tagworld	Social Networking	7,000,000 Unique Visitors (1/06) vs. 3,000,000 (8/05)
Eurekster	Personalized Search	3,000,000 Unique Visitors (1/06) vs. 1,000,000 (8/05)
Lastfm	Personalized Radio	2,000,000 Unique Visitors (1/06) vs. 528,000 (7/05)
digg	News Aggregator	2,000,000 Unique Visitors (1/06) vs. 579,000 (7/05)
xfire	IM for Gamers	348,000 Unique Visitors (1/06) vs. 185,000 (8/05)
technorati	Blog Search Engine	Over 29,000,000 blogs indexed

Source: Morgan Stanley⁵¹

Select Top Web Properties and Their Growth

Brand	Unique Audience (millions)		Growth (%)
	November 2004	November 2005	
Apple	19.6	30.8	57
Google	66.4	85.5	29
Amazon	36.7	42.5	16
MapQuest	31.2	35.1	13
Real	30.6	34.4	12
eBay	51.1	56.3	10
Yahoo!	94.4	103.9	10
Microsoft	89.1	96.1	8
AOL	71.5	74.3	4
MSN	89.5	91.3	2

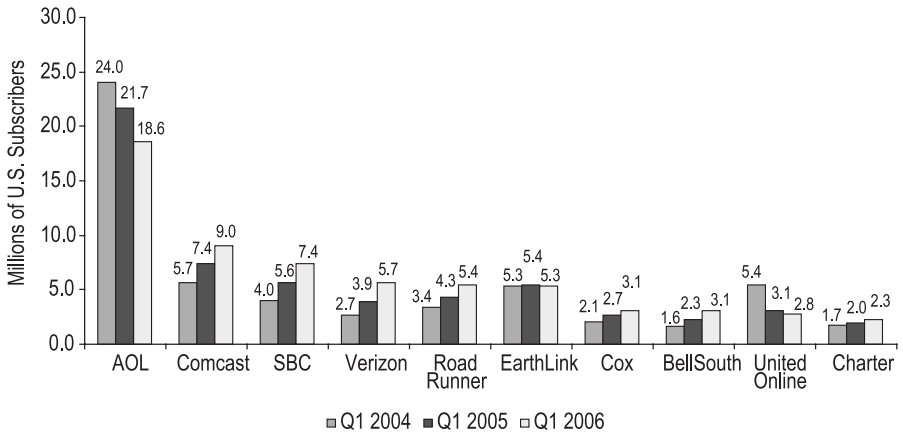
Source: Nielsen//NetRatings⁵²

Internet Service Providers and Web Browsers

Internet service providers (ISPs) are the principal gateways to cyberspace for Internet users. For many years, the dominant form of home Internet access was dial-up service using phone lines and a modem. In July 2004, broadband surpassed dial-up as the dominant Internet access type. As broadband becomes more affordable, many dial-up users are switching over to take advantage of its faster speed and convenience.

- AOL is still the leading U.S. ISP by number of subscribers, with 18.6 million at the end of the first quarter of 2006,⁵³ but its subscriber base continues to decrease. AOL charges a higher fee than the others, but provides additional services. However, these services are becoming increasingly less attractive to Internet users.
- The largest ISP worldwide in 2006 by active subscribers is AOL, with 26 million. T-Online of Germany is next with 13.5 million subscribers, followed by Wanadoo of France with 9.7 million, and Comcast of the U.S. with 8.5 million. Earthlink and United Online, both of the U.S., each have 5 million subscribers. KT-Megapass (5 million subscribers) of South Korea, Tiscali (4.5 million subscribers) of Italy, Freenet (4 million subscribers) of Germany, and BT Openworld (2 million subscribers) of the United Kingdom round out the top ten.⁵⁴
- A web browser is an interface that allows a user to navigate the Internet.⁵⁵ In 1999, Microsoft's Internet Explorer became the most common web browser. Internet Explorer is still the world's most popular browser, with a market share over 86 percent in 2006.⁵⁶
- Mozilla Firefox, the second most common web browser since 2003, is an open-source project based on the Netscape Navigator browser,⁵⁷ which was the most common browser from 1996 to 1998.⁵⁸
- In Canada, Mozilla's share of the browser market in November 2005 was 17 percent, while in the United Kingdom its share was only 4.9 percent.⁵⁹

Top Internet Service Providers



Source: ISP Planet⁶⁰

Web Browser Shares (percent)

	Mosaic	Netscape Navigator	Internet Explorer	Mozilla Firefox	Safari	Opera	Others
1994	95.0	0.0	0.0	0.0	0.0	0.0	5.0
1995	37.5	55.0	0.0	0.0	0.0	0.0	7.5
1996	7.5	80.0	3.8	0.0	0.0	0.0	8.8
1997	2.5	72.5	17.5	0.0	0.0	0.0	7.5
1998	0.0	60.0	35.0	0.0	0.0	0.0	5.0
1999	0.0	35.0	62.5	0.0	0.0	0.0	2.5
2000	0.0	15.0	83.8	0.0	0.0	0.0	1.3
2001	0.0	9.0	90.0	0.0	0.0	0.0	1.0
2002	0.0	2.5	95.3	1.0	0.0	0.0	1.3
2003	0.0	0.8	94.8	2.0	0.0	0.0	2.5
2004	0.0	0.0	92.6	4.0	1.0	0.6	1.8
2005	0.0	0.0	86.9	9.5	1.6	0.7	1.2
2006	0.0	0.0	86.7	9.6	5.0	0.5	0.5

Source: Wikipedia⁶¹

Chapter 2

The Hardware Sector

Beginning with Dr. Jack Kilby's invention of the integrated circuit in 1958, the digital economy has been powered by an extraordinary succession of innovations in electronics and computing technologies. Since then, computing performance has followed the path forecast by Intel co-founder Gordon Moore. Moore's Law states that the number of transistors applied to a single microchip doubles approximately every 18 months—for practical purposes doubling the computing power of the chip. Harvard economist Dale Jorgensen has described Moore's 1965 prediction as "astonishingly accurate," and emphasized its importance in the resurgence of U.S. productivity growth.

One phenomenon currently affecting many aspects of the digital economy is the blurring of lines between products and services that were once quite distinct. In the hardware sector, this trend is most obvious regarding the numerous options available for cell phones. A top-of-the-line cell phone from 2006 can do about as much (access the Internet, play games, store documents, etc.) as a personal computer from 1996.

In the 1960s and 1970s, the color TV took 12 years to reach 10-percent adoption and 18 years to reach 50-percent adoption. In the 1970s and 1980s, the personal computer took only four years to reach 10-percent adoption, but also took 18 years to reach 50-percent adoption. In the 1980s and 1990s, cell phones took eight years to reach 10-percent adoption and only 15 years to reach 50-percent adoption; CD players took only 4.5 years to reach 10-percent adoption and only 10.5 years to reach 50-percent adoption.¹ Adoption rates depend on many factors, but as time goes on, many of the most important products are being adopted more quickly by a majority of the population.

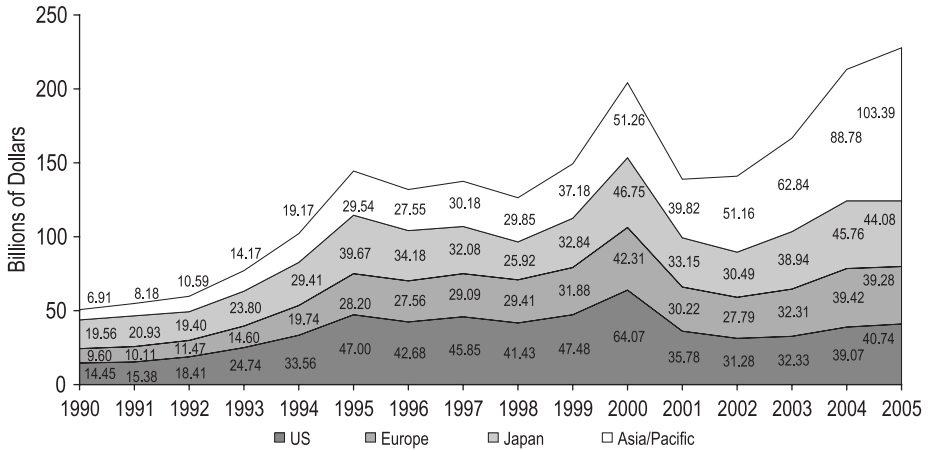
In 1971, Intel debuted its first microprocessor with a speed of 108 kilohertz. Today's Pentium 4 chips can run at 3.4 gigahertz, or 31,482 times as fast. As a result of these achievements, and a multitude of improvements in storage capacity (hard drives, CDs, and DVDs), communications (the Internet, modems, broadband, wireless), and other systems, current bargain-basement systems provide functionality virtually undreamed of when the IBM PC came to market in 1976. There are also just as many possibilities for the future expansion of technology as there ever were, with nanotechnology attracting significant attention in recent years.

Semiconductor Sales

All computers and devices that use radio waves now use semiconductors. Semiconductors are usually made of silicon and come in many types, including transistors, memory chips, and microprocessors. Although in recent years the variety of computing devices has increased dramatically to include PDAs, portable music players, gaming consoles, cell phones, and several other electronic devices, the basic building blocks of these devices are still semiconductors. Improvements in semiconductor technology contribute significantly to broader advances in the digital economy, and the prices and sales of semiconductors are important indicators of the state of technological evolution.

- Most of the growth in semiconductor sales between 2004 and 2005 was in the Asia and Pacific region (excluding Japan), where semiconductor sales in dollars have increased 160 percent since 2001. Over the same period, sales increased only 33 percent in Japan, 30 percent in Europe, and 14 percent in the U.S.²
- From 2002 to 2005 the semiconductor industry exhibited a constant and stable growth pattern, unlike the sometimes stagnant and sometimes volatile conditions it experienced from 1996 to 2001.³
- Intel maintained its worldwide leadership in semiconductor sales in 2005 and even saw its revenues increase by 14 percent. Intel has been the global leader in semiconductor sales since 1995.⁴
- However, Intel's profits have declined in recent years, and its market share of the server industry has fallen from nearly 100 percent in 2001 to 85 percent in early 2006.⁵
- Among the other top ten vendors, Toshiba, Samsung, Hynix, and Advanced Micro Devices (AMD) exhibited the most growth in 2005, while NEC and Infineon saw their revenues decline the most.⁶
- The annual price index of semiconductors decreased by an average of 37.2 percent per year from 1997 to 2004. Scaling the index such that its value in 2002 is 100, it was 1,662 in 1997, compared with 61 in 2004.⁷

Global Semiconductor Sales



Source: Semiconductor Industry Association⁸

Top Semiconductor Vendors' Revenues and Market Shares

Company	Revenue (\$billions)						Share (%)			
	2000	2001	2002	2003	2004	2005	2002	2003	2004	2005
Intel	30.3	24.9	24.2	26.9	30.7	35.1	15.5	15.1	14.0	15.0
Samsung	10.6	6.3	8.2	10.5	16.3	17.9	5.3	5.9	7.4	7.6
Texas Instruments	9.2	6.1	6.2	7.4	9.7	10.5	4.0	4.2	4.4	4.4
Toshiba	10.9	6.8	6.5	7.4	8.5	9.3	4.2	4.1	3.9	3.9
STMicroelectronics	7.9	6.4	6.3	7.2	8.8	8.8	4.1	4.0	4.0	3.8
Renesas Technology	n/a	n/a	n/a	7.9	9.0	8.8	n/a	4.5	4.1	3.7
Infineon Technologies	n/a	n/a	5.3	6.9	8.9	8.3	3.4	3.9	4.1	3.5
NEC	10.6	5.4	5.7	5.6	6.4	5.8	3.7	3.2	2.9	2.5
Hynix Semiconductor	n/a	n/a	n/a	n/a	4.6	5.7	n/a	n/a	2.1	2.4
AMD	n/a	n/a	n/a	n/a	5.0	5.7	n/a	n/a	2.3	2.4
Worldwide Total	227.0	153.2	155.4	178.2	220.0	235.0	100.0	100.0	100.0	100.0

Source: Gartner⁹

Personal Computer Sales

According to IDC, the worldwide PC market is expected to grow by just over 10 percent per year through 2008, a decline from the 15-percent growth it maintained in 2004 and 2005.¹⁰ By 2010, there are expected to be 290 million PCs in use in the U.S., approximately one for every adult and teenager in the country. Worldwide, the number is expected to be 1.34 billion, which makes for a much lower ratio of computers to people. However, the number of worldwide PCs is expected to grow at a faster rate than the number of PCs in the U.S.¹¹

- Dell and HP, which have together been responsible for a majority of U.S. PC shipments since 2001, maintained their leadership domestically and internationally in 2006. However, in the quickly-growing EMEA (Europe, the Middle East, and Africa) markets, though HP and Dell are the two largest providers, their 2005 market shares of 15.9 percent and 11.6 percent, respectively, show that this area's PC market is much more fragmented than the U.S. PC market.¹²
- Worldwide sales of notebook computers are expected to rise 31.4 percent in 2006, and growth is expected to be especially strong in emerging countries. Desktop computer sales, on the other hand, are expected to grow by only 1.9 percent.¹³
- The top three desktop computers ranked by unit volume in the first quarter of 2006 were HP (average selling price \$642), Dell (average selling price \$860), and Gateway (average selling price \$616).¹⁴
- The top four notebook computers ranked by unit volume in the first quarter of 2006 were Dell (average selling price \$1,187), HP (average selling price \$999), Toshiba (average selling price \$945), and Gateway (average selling price \$892).¹⁵
- In the U.S., there were 23.6 million consumer PCs shipped in 2005, and 40.3 million commercial PCs shipped; these numbers are expected to grow to 29 million consumer PCs and 45.9 million commercial PCs in 2007. Worldwide, there were 78.3 million consumer PCs shipped in 2005, and 129.3 million commercial PCs shipped; these numbers are expected to grow to 98.7 million consumer PCs and 155.3 million commercial PCs in 2007.¹⁶

Worldwide PC Unit Shipments by Region

Region	Shipments (millions)			Market Share (%)		
	2004	2005	Q1 2006	2004	2005	Q1 2006
Europe, Middle East, and Africa	62.0	72.6	19.1	32.7	33.2	33.4
United States	62.4	67.2	16.4	32.9	30.7	28.6
Asia/Pacific	33.9	42.8	11.6	17.9	19.6	20.3
Latin America	11.7	14.7	4.0	6.2	6.7	7.0
Japan	13.6	14.7	4.4	7.2	6.7	7.6
Canada	5.8	6.6	1.7	3.1	3.0	3.0
Total	189.4	218.6	57.2	100.0	100.0	100.0

Source: Gartner¹⁷

Worldwide PC Unit Shipments by Company

Company	Shipments (millions)			Market Share (%)		
	2004	2005	Q1 2006	2004	2005	Q1 2006
Dell	31.0	36.8	9.4	16.4	16.8	16.5
Hewlett-Packard	27.6	31.8	8.5	14.6	14.5	14.9
Lenovo	12.9	15.1	3.4	6.8	6.9	6.0
Acer	6.4	10.2	2.8	3.4	4.6	5.0
Fujitsu/Fujitsu Siemens	7.1	8.3	2.2	3.8	3.8	3.9
Others	104.4	116.4	30.7	55.1	53.3	53.7
Total	189.5	218.5	57.0	100.0	100.0	100.0

Source: Gartner¹⁸

U.S. and Worldwide PCs in Use

USA	1995	2000	2005	2010*
PCs in Use (millions)	84.5	177.0	230.0	290.0
Mobile PCs in Use (millions)	13.2	34.4	68.5	125.0
Mobile PCs in Use Share (%)	15.6	19.4	29.7	43.0
PC Sales (millions)	21.4	46.0	57.3	68.7
Mobile PC Sales (millions)	4.1	10.4	20.4	30.1
Mobile PC Sales Share (%)	19.1	22.7	35.6	43.8
Worldwide	1995	2000	2005	2010*
PCs in Use (millions)	225.0	530.0	898.0	1,338.0
Mobile PCs in Use (millions)	31.0	96.0	229.0	481.0
Mobile PCs in Use Share (%)	13.7	18.1	25.5	36.0
PC Sales (millions)	58.0	131.0	190.0	267.0
Mobile PC Sales (millions)	10.0	28.3	60.0	104.0
Mobile PC Sales Share (%)	17.2	21.6	31.6	39.0

* Projections

Source: Computer Industry Almanac Inc.¹⁹

Cell Phones and PDAs

Originally designed to only include functions such as storing contact information and personal calendars, PDAs (personal digital assistants) can now be used for many other purposes, including functioning as cell phones, connecting to the Internet, and playing audio files. Similarly, cell phones, which originally served merely as portable telephones with little memory or computing power, have expanded to offer similar options. Any phone that has one or more of these capabilities can be called a “smartphone.”²⁰ The formerly clear boundary between the descendants of the mobile phones and Palm Pilots of the 1990s is becoming increasingly blurry, but the main purpose of a smartphone is still to serve as a phone, and the main purpose of a PDA is to serve as an organizational device on which data can be stored.

- ABI Research estimates that 123 million smartphones will be shipped worldwide in 2006, giving them a 15-percent share of the cellular phone market.²¹
- Worldwide mobile phone sales are expected to reach one billion in 2009, when there will be a total of 2.6 billion mobile phones in use worldwide. Approximately one-fifth of mobile phones sold in the next few years are expected to be smartphones.²²
- According to iSuppli, the cell phone premium content market is expected to grow to \$43 billion by 2010, a compound annual growth rate of 42.5 percent from \$5.2 billion in 2004. The opportunities for selling music, gaming, and video for mobile phones are likely to grow in the near future.²³
- There is an interesting difference between the extent to which Americans and citizens of other countries use smartphones and PDAs. In 2005, Americans bought 3.8 million smartphones and 6.2 million PDAs, a ratio of 0.6 smartphones per PDA. Worldwide, however, people bought 3.4 times as many smartphones as PDAs, and in Western Europe the ratio was 6.6.²⁴
- After a protracted legal battle, RIM agreed to pay NTP \$612.5 million in March 2006 to settle all patent claims against it. RIM’s popular Blackberries had used a technology patented by NTP, which could have resulted in interrupted service for Blackberry users.²⁵
- According to Morgan Stanley, 89 percent of mobile subscribers and 93 percent of mobile Internet users are located outside of the U.S.; mobile technology is a rare case in which the United States is lagging behind much of the rest of the world in adoptions. China, due not only to its large population but also its recent economic ascendancy and paucity of similar preexisting technologies, has the largest number of mobile users of any country in the world.²⁶

Worldwide Mobile Phone Sales (millions of units)

Company	2004			2005				2006
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Nokia	46.4	52.2	64.4	55.0	60.8	67.0	82.2	76.1
Motorola	24.6	22.6	31.7	30.1	34.0	38.5	41.9	45.5
Samsung	19.0	23.0	23.9	24.5	24.5	25.7	28.4	28.1
LG	9.5	11.2	13.3	11.5	12.4	13.4	16.9	14.5
Sony Ericsson	10.4	10.7	12.3	9.9	11.8	13.8	16.1	13.6
Others	46.8	48.5	49.6	50.0	47.0	47.1	49.6	46.2
Total	156.6	168.3	195.3	181.0	190.5	205.4	235.1	224.0

Sources: Gartner, Tekrat²⁷

Worldwide PDA Shipments by Company (thousands of units)

Company	2004			2005				2006
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Research in Motion	510	565	698	711	840	862	780	930
Palm	913	749	1,227	615	642	479	1,038	460
Hewlett-Packard	530	692	869	601	451	548	660	421
Others	796	853	1,315	1,501	1,683	1,560	1,931	1,842
Total	2,749	2,859	4,109	3,428	3,616	3,449	4,409	3,654

Totals do not include smartphones, such as the Treo 650 and Blackberry 7100, but include wireless PDAs, such as the iPAQ 65xx and Blackberry 8700.

Source: Gartner²⁸

Worldwide Mobile Phone Sales (millions of units)

Year	Sales
1997	107.84
1998	175.65
1999	295.15
2000	414.99
2001	413.31
2002	427.37
2003	519.99
2004	674.00
2005*	778.75
2006*	847.24
2007*	914.02
2008*	980.29
2009*	1,041.52

* Projections

Source: Gartner²⁹

Smartphone/PDA Sales (millions of units)

	2003	2005	2006*	2011*
Worldwide				
Smartphone Sales	7.40	46.50	69.20	190.00
PDA Sales	12.70	13.50	13.90	16.60
Handheld PC Sales	n/a	0.01	0.08	3.30
Handheld Computer Sales	20.10	60.10	83.20	210.00
USA				
Smartphone Sales	0.34	3.77	7.58	31.80
PDA Sales	6.09	6.21	6.31	7.00
Handheld PC Sales	n/a	0.01	0.05	1.20
Handheld Computer Sales	6.43	10.00	13.90	40.00
Western Europe				
Smartphone Sales	4.41	18.70	25.30	47.50
PDA Sales	2.55	2.85	2.94	3.59
Handheld PC Sales	n/a	n/a	0.01	0.80
Handheld Computer Sales	6.96	21.60	28.20	51.90

* Projections

Source: Computer Industry Almanac³⁰

Other Consumer Hardware

Increases in computing power have resulted in the proliferation of many other kinds of hardware over the past several years. According to the NPD Group, U.S. consumers spent \$76.9 billion on consumer electronics and IT products in 2005, which is an increase of 8 percent from the 2004 figure of \$71.2 billion. The fastest-growing items included MP3 players and flat panel TVs.³¹

- In-Stat predicts that from 2003 to 2009, the three fastest-growing consumer electronic devices worldwide will be portable digital audio players (57-percent compound annual growth rate), LCD televisions (52-percent CAGR), and DVD recorders (51-percent CAGR).³²
- The digital music industry, which makes up 13.9 percent of total consumer spending on music in Western Europe and North America,³³ is dominated by the iPod. In the U.S. in February 2006, nine of the top ten MP3 players ranked by market share were iPods.³⁴ Use of iTunes grew 241 percent during 2005, with Apple's iTunes website garnering 20.7 million unique visitors in December 2005 versus only 6.1 million a year before.³⁵ Forty-nine percent of MP3 player owners worldwide own an iPod.³⁶
- DVRs were installed in 17.4 million homes worldwide at the end of 2005, and 12 percent of U.S. homes have DVRs.³⁷ iSuppli says that subscriptions to DVR services will rise almost 600 percent by 2010.³⁸ This technology does not necessarily increase total television viewing, as once was thought, but it is likely to affect the way the \$74 billion television advertising market operates; 53 percent of DVR subscribers use DVRs to skip commercials.³⁹
- As of April 2006, there have been 101 million PlayStation 2's sold worldwide, compared with 24 million Microsoft Xbox's and 21 million Nintendo Gamecubes. In the U.S., the Playstation 2 has a market share of 55 percent.⁴⁰
- The digital satellite and terrestrial radio console market is expected to grow from 5 million unit shipments in 2004 to 22 million unit shipments in 2009.⁴¹
- The digital camera industry faces competition from camera phones, which are expected to account for almost 60 percent of the nearly 500 billion digital images captured by 2009.⁴²

Worldwide Electronic Device Sales (millions of units)

Device	2000	2001	2002	2003	2004	2005*	2006*
CD Players	104.0	102.8	106.5	111.0	117.0	122.0	124.0
Mini Disc Players	13.0	14.5	16.4	18.0	19.4	20.7	22.3
Portable MP3 (Flash) Players	n/a	n/a	n/a	12.5	26.4	55.4	82.5
Portable MP3 (HD) Players	n/a	n/a	n/a	2.7	12.5	20.5	23.1
Set-Top Boxes	21.7	24.6	26.8	30.2	39.3	46.2	51.4
Gaming Consoles	8.7	22.9	31.2	28.2	26.1	25.6	23.9
Handheld Gaming Devices	n/a	14.0	14.1	15.4	19.7	29.5	21.3
PDAs	11.0	13.1	12.1	13.4	15.7	n/a	n/a

* Projections

Source: Morgan Stanley⁴³

Worldwide Electronic Device Growth

Device	Unit Sales Growth 2004-2005 (%)	Dollar Volume Growth 2004-2005 (%)
LCD TVs	160	127
MP3 Players	159	121
Plasma TVs	128	70
Notebook Computers	45	21
Digital Cameras	21	16

Source: NPD Group⁴⁴

Chapter 3

The Communications Sector

Telecommunications, defined as the transmission of communications signals across long distances, has come a long way since the days of smoke signals and homing pigeons. The invention of the telegraph in 1792, the telephone in 1857, and the television in 1927 each depended on some form of wires to transmit information.

The first wireless transmission of a human voice was in 1900, but wireless communication technologies were utilized mainly by radio and television for most of the twentieth century. In the last decade of the twentieth century, however, the growth of the Internet and mobile phones created a technological revolution that engendered a huge amount of innovations, with wireless technologies finally being used by a wide variety of devices. As of mid-2006, wireless calls made up about a third of all local calls and about three-fifths of all long distance calls.¹

One of the major developments in recent years is the emergence of VoIP (voice over Internet protocol) and cable as major competitors in the voice marketplace. This has also facilitated the offering of bundles of services that include cable television, broadband Internet, and VoIP-telephony, which means that traditional lines of business in communications have broken down.

Total spending in the U.S. telecommunications sector reached an estimated \$856.9 billion in 2005 (an increase of 8.9 percent over 2004) and is expected to increase 10.2 percent in 2006 to \$944.7 billion, according to TIA. By 2009, the U.S. telecommunications industry is expected to reach \$1.2 trillion in size.² Global international communications spending was \$2.7 trillion in 2005 and is expected to reach \$3.9 trillion in 2009. The fastest-growing region in 2005 was the Middle East and Africa, where spending grew 18.4 percent to reach \$66.7 billion.³

The term “broadband” is used in order to distinguish between wide and narrow bandwidth, though the dividing line is nebulous. The International Telecommunication Union defined broadband as a transmission capacity greater than 1.5 to 2 megabits per second, but rates slower than that are sometimes also referred to as broadband.⁴

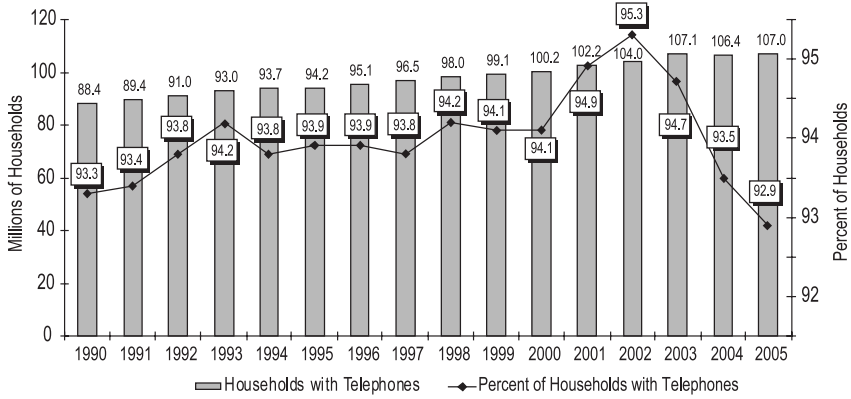
The demand for wireless data transfer increases as the usage of devices capable of accessing large quantities of video and audio data grows. The communications network must be able to support this increase in demand, and this is what third generation (3G) network technology is designed to do. Although only currently widely used in Japan, it is expected that 3G will eventually make it much easier for large files to be transmitted wirelessly.

Telephone Subscribership

The U.S. communications industry has undergone dramatic changes in the past few years, with the emergence of mobile wireless telephone networks, broadband Internet access, Voice over Internet Protocol (VoIP), cable telephony, and the introduction of fixed wireless networks in some areas. Although wireline telephone service continues to provide the primary voice and data communications links for most American households, subscribership has been declining, while the number of wireless subscribers has seen rapid growth.

- In November 2005, the telephone penetration rate in the U.S. was 92.9 percent.⁵
- The number of households with telephones has remained roughly constant from 2003 to 2005, while the percentage of households with telephones has been declining each year since 2002.⁶ This is primarily due to the substitution of cellular telephones for landline telephones.
- At some point during 2000, the number of U.S. wireless subscribers passed the number of U.S. landline subscribers, and since then the gap has continued to grow. In 2005, 107 million U.S. households subscribed to a landline telephone service, while 208 million Americans subscribed to a wireless telephone service.⁷
- Fixed-line telephones are a \$190 billion industry, but this size is expected to decrease, perhaps dramatically, in the coming years, as wireless companies, cable companies, and ISPs offer different technologies that allow for voice transmission.⁸
- The average monthly and long distance residential phone bill in the U.S. in 2005 was slightly less than \$51 according to J.D. Power and Associates.⁹
- According to the most recent CIA estimates, there are 1.2 billion telephone main lines in use worldwide. Of these, 312 million are in China, 268 million are in the U.S., and 239 million are in the European Union.¹⁰

U.S. Household Landline Telephone Subscribership



Data are for November of each year.

Source: FCC¹¹

Telephone and Cellular Subscribers of Select Countries, 2005

	GDP per Capita (\$US)	Total Telephone Subscribers (thousands)	Total Telephone Subscribers per 100 Inhabitants	Cellular Subscribers per 100 inhabitants	Cellular Subscribers as a Percent of Total Telephone Subscribers
Congo	120	2,756.6	0.88	0.83	n/a
Egypt	1,118	24,025.8	32.45	18.41	56.7
Nigeria	506	19,820.0	15.07	14.14	93.8
Africa	746	139,456.8	12.25	11.29	82.2
Argentina	4,007	30,900.0	80.07	57.27	71.5
Brazil	3,338	107,987.2	59.78	46.25	67.0
Colombia	2,141	18,167.6	40.08	47.81	73.7
Mexico	6,328	66,974.1	62.58	44.34	70.9
United States	36,273	360,347.0	122.71	67.62	53.1
North and South America	15,292	704,388.4	80.06	51.51	60.7
China	1,268	743,861.0	56.53	29.90	52.9
India	634	124,836.1	11.31	6.89	60.9
Indonesia	1,156	59,682.2	26.79	21.06	78.6
Japan	31,324	153,525.0	119.86	73.97	61.7
Pakistan	614	18,048.7	11.72	8.30	70.8
Asia	2,487	1,435,447.7	37.39	22.24	58.8
France	33,674	83,758.4	138.45	79.44	57.4
Germany	33,156	134,246.0	162.35	95.78	59.0
Italy	28,764	96,584.0	166.26	123.14	74.1
Poland	5,427	35,554.1	92.23	75.94	70.1
Russia	2,370	160,100.0	111.57	83.62	75.0
Spain	23,930	59,649.9	139.72	96.81	69.3
Turkey	4,176	62,587.2	85.51	59.58	69.7
Ukraine	1,344	25,877.0	53.74	37.04	58.6
United Kingdom	26,369	94,791.0	158.51	102.16	64.4
Europe	16,929	994,543.7	124.03	84.42	67.3
Australia	25,436	29,880.0	148.25	91.39	61.6
Oceania	18,561	35,542.8	110.30	68.51	62.5
World Total	5,944	3,309,379.4	49.45	31.90	62.9

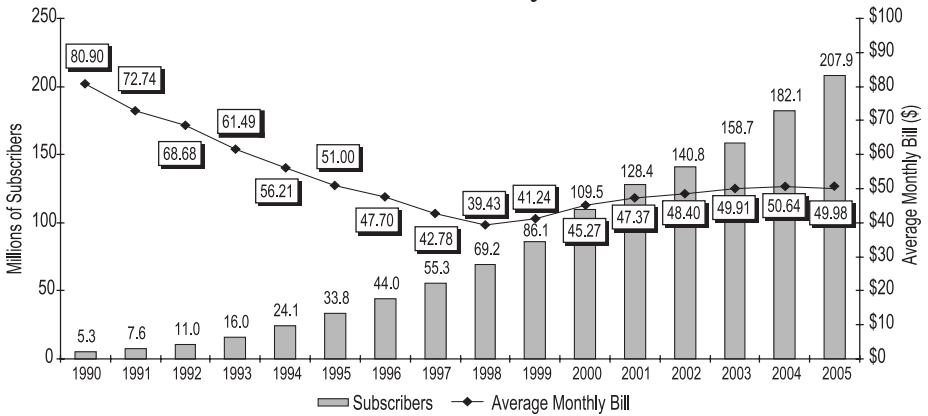
Source: International Telecommunications Union¹²

Wireless Subscribership

The wireless industry in the U.S. continues to grow at a rate consistent with that of the past several years. Average spending per subscriber is expected to increase by about 2.4 percent per year. According to the FCC, in 2005, 97 percent of the U.S. population lived in counties that were served by at least three different mobile operators; in 2000, this figure was 88 percent.¹³

- Revenue in the U.S. wireless market reached \$174.7 billion in 2005, a 10.7-percent increase from 2004. Twenty-five million new wireless subscribers were added in 2005.¹⁴
- According to CTIA, nine countries had wireless penetration rates higher than 100 percent in 2005 (Hong Kong, Luxembourg, Lithuania, Italy, Israel, Czech Republic, Sweden, the U.K., and Taiwan),¹⁵ suggesting that subscriber growth in the U.S., where the wireless penetration rate is currently about 65 percent,¹⁶ is likely to continue.
- U.S. consumers face much lower wireless charges than the rest of the world. The average U.S. wireless consumer spends \$54 per month on wireless services but would pay about \$125 for the same services in the European Union.¹⁷
- As of mid-2006, the leading wireless providers and their market shares were Verizon (36 percent), Cingular (28 percent), Sprint Nextel (21 percent), and T-Mobile (15 percent).¹⁸
- Sales of wireless data (which include games, ringtones, and music) rose 66 percent between 2004 and 2005 to \$7.8 billion. By 2009, this amount is expected to increase to \$24.3 billion, which would then be 16.5 percent of wireless sales.¹⁹
- Twenty-four percent of mobile subscribers in the U.S. changed providers between 2004 and 2005, and 16 percent plan to switch in the future.²⁰
- Gartner predicts that 99 percent of new voice connections and 70 percent of total voice connections will be wireless by 2009.²¹
- According to the most recent CIA estimates, there are 1.75 billion mobile and cellular phones in use worldwide, with 335 million of them in China, 194 million in the U.S., and 315 million in the European Union.²²

U.S. Wireless Subscribers and Monthly Bills



Source: Cellular Telecommunications & Internet Association²³

Wireless Infrastructure Revenues by Region (\$Millions)

Region	2000	2001	2002	2003	2004	2005*	2006*	2007*	2008*	2009*	2010*
Asia Pacific	17,532	19,141	13,456	14,576	16,916	19,345	21,388	23,283	25,050	26,517	27,816
EMEA	25,005	20,433	17,835	17,767	22,949	27,073	29,171	30,690	31,079	31,502	31,703
Latin America	7,261	6,773	3,485	2,732	4,331	5,336	5,658	5,972	6,138	6,509	6,819
North America	12,948	12,768	11,443	10,990	12,239	14,734	15,634	16,849	18,028	18,569	19,126
Worldwide	62,746	59,115	46,219	46,064	56,435	66,489	71,851	76,794	80,295	83,097	85,463

* Projections

Source: Morgan Stanley²⁴

Cellular Subscribers by Region

Cellular Subscribers Per 1000 People	1990	1995	2000	2005	2010*
United States	21.10	127.0	388	683	946
W. Europe	9.10	60.0	634	930	1,008
Asia-Pacific	0.40	7.1	71	230	379
Worldwide	2.10	15.6	123	319	478
Internet Users Per 1000 People	1990	1995	2000	2005	2010*
United States	7.20	105.0	477	668	839
W. Europe	0.50	22.0	224	535	788
Asia-Pacific	0.03	1.2	34	116	193
Worldwide	0.40	7.9	69	167	262
PCs In Use Per 1000 People	1990	1995	2000	2005	2010*
United States	192.00	321.0	628	778	932
W. Europe	69.00	158.0	330	543	755
Asia-Pacific	4.80	14.6	39	75	118
Worldwide	18.60	40.0	87	140	201

* Projections

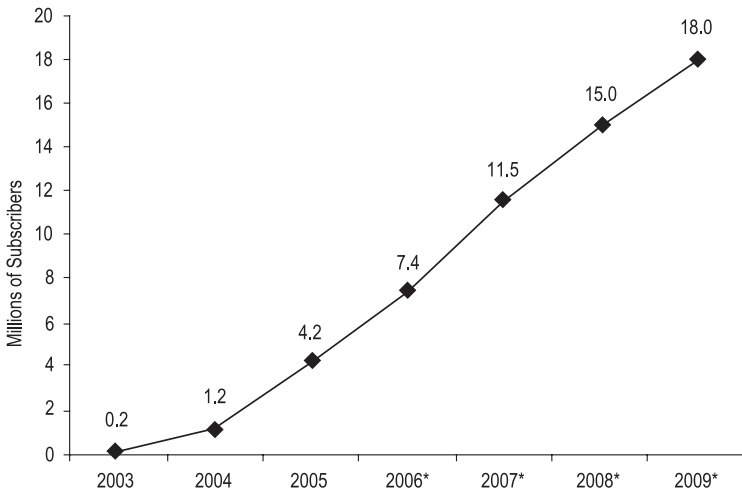
Source: Computer Industry Almanac²⁵

Voice Over Internet Protocol (VoIP)

VoIP is an important innovation in telecommunications. It allows for voice communications to travel over packet-switched networks, rather than traditional circuit-switched networks. VoIP calls can travel over private data networks or the public Internet. An additional advantage of VoIP is that it facilitates the bundling of services (television, telephone, and Internet), which carries significant implications for the future of communications industry business models.

- U.S. VoIP subscriptions grew 189 percent in 2005, reaching 5.5 million in the first quarter of 2006. TeleGeography expects the number to reach 9.6 million by the end of 2006.²⁶ The Telecommunications Industry Association's predictions are different, but they also predict significant growth in the VoIP industry in the future, with a 43.9-percent CAGR through 2009.²⁷
- Annual U.S. VoIP revenues reached \$1 billion in 2005, after totaling only \$212 million in 2004.²⁸ TIA expects this figure to reach \$5.1 billion by 2009.²⁹
- The worldwide cable telephony industry saw its revenues reach \$5.6 billion in 2005, after earning \$4.5 billion in 2004. The figure is expected to hit \$10 billion by 2009.³⁰
- In 2005, cable companies were responsible for 53 percent of VoIP minutes on broadband networks in the U.S. Vonage had 21.7 percent, Skype had 14.4 percent, and other third-party VoIP providers had the other 10.9 percent of minutes.³¹
- eBay's acquisition of VoIP provider Skype shows the high importance that consumer-oriented web companies place on communications technologies such as messaging and VoIP.³²
- The recent surge in VoIP subscribership and the already large number of cable broadband subscribers has made the bundling of services more common. Highly beneficial to consumers, broadband can provide households with cable television, telephone service, and Internet access, with all three services covered under one monthly bill, often at a lower rate than the three services would cost if purchased separately. DSL and fiber subscribers can also take advantage of a variety of bundling options. In early 2006, 43 percent of households subscribed to some form of bundled services; the figure was 33 percent a year earlier.³³ Current revenue from triple-play bundled services (Internet, voice, and video) averages \$148 per subscriber per month.³⁴

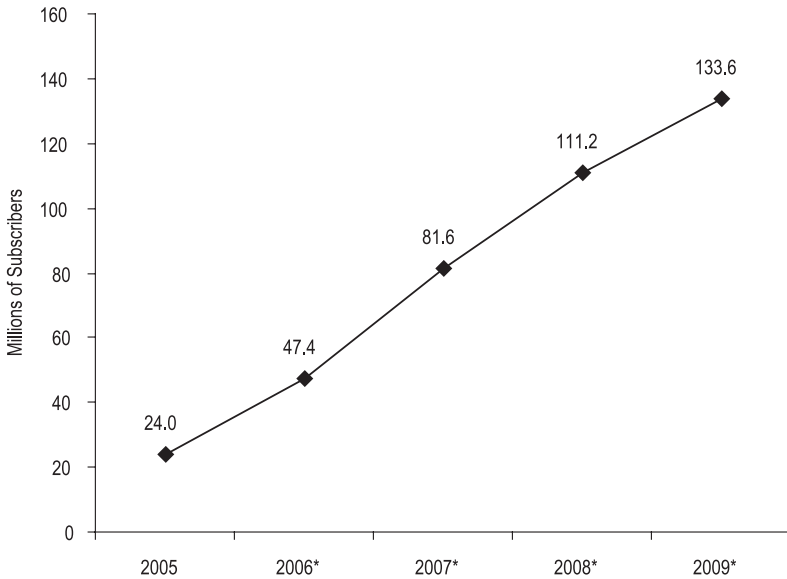
U.S. Residential VoIP Subscribers



* Projections

Source: Telecommunications Industry Association³⁵

Global VoIP Subscribers



* Projections

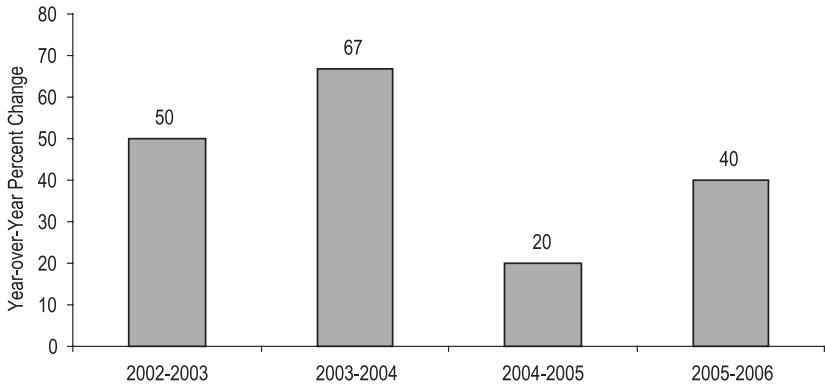
Source: Business Week Online³⁶

U.S. Broadband Adoption

The number of active home broadband users in the U.S. was 95.5 million in February 2006, a 28-percent increase over February 2005. This means that 68 percent of active Internet users accessed the Internet with some form of broadband technology in February 2006, an all-time high.³⁷ However, only 28 percent of all American households subscribed to broadband service in 2005.³⁸

- The number of broadband subscribers per 100 inhabitants in the U.S. was 16.8 in 2005, up from 12.9 in 2004 and 4.5 in 2001.³⁹
- Among adults in the U.S., the broadband penetration rate has increased steadily from 2001 to 2005, from 3 to 24 percent for rural adults, 9 to 40 percent for suburban adults, and 9 to 38 percent for urban adults.⁴⁰
- The percent of zip codes with high-speed providers is an important indicator of how widely available broadband services are and how competitive providers are likely to be. In 2000, 33 percent of zipcodes had no high-speed providers, 25.9 percent had only one, 17.8 percent had two, 9.2 percent had three, and 14.1 percent had four or more. In 2005, only 2 percent of zipcodes had no high-speed providers, 9.3 percent had only one, 14.1 percent had two, 15 percent had three, and 59.7 percent had four or more. This shows that there has been a significant increase in both the availability of and competition among high-speed providers since 2000.⁴¹
- There is a gap between broadband subscribership in rural and urban areas.⁴² In December 2005, 24 percent of adults in rural parts of the U.S. had broadband, compared to 39 percent of urban and suburban adults. A Pew report on rural Internet broadband use found that adoption in rural areas was occurring at a faster rate than in more populated areas.⁴³
- In spite of recent growth in overall broadband adoption, it seems to be slowing, suggesting that there is not as much pent-up demand for high-speed Internet use as there used to be.⁴⁴
- In 2002, years of online experience and having broadband at home were each significant drivers of Internet use. But in 2005, having broadband at home became much more significant, and years of online experience faded in significance.⁴⁵ This suggests that (1) the Internet has become enough of a fixture of American life that Internet usage is due less to Internet familiarity and more to personal preferences, and (2) broadband subscribership and Internet usage are highly correlated, and are becoming increasingly more so.

Growth in U.S. Home Broadband Adoption



* Growth from March in one year to March in the next year.

Source: Pew Internet & American Life Project⁴⁶

How Broadband is Spreading Through the U.S. Population

Gender	Percent with Broadband at Home		Percent Increase
	2005	2006	
Male	31	45	45
Female	27	38	41
Age			
18-29	38	55	45
30-49	36	50	38
50-64	27	38	41
65+	8	13	63
Race/Ethnicity			
White (not Hispanic)	31	42	35
Black (not Hispanic)	14	31	121
Hispanic (English Speaking)	28	41	46
Educational Attainment			
Less than High School	10	17	70
High School	20	31	55
Some College	35	47	34
College +	47	62	32
Household Income			
Under \$30K	15	21	40
\$30K - \$50K	27	43	59
\$50K - \$75K	35	48	37
Over \$75K	57	68	19
Community Type			
Urban	31	44	42
Suburban	33	46	39
Rural	18	25	39

Source: Pew Internet & American Life Project⁴⁷

Worldwide Broadband Adoption

The total number of Internet broadband subscribers worldwide reached 217 million in 2005; in 1999 the number was 5 million, and in 2002 it was 67 million. It is forecasted to reach 500 million in 2010, when the number of total worldwide Internet users is predicted to reach 1.8 billion.⁴⁸ In spite of the growth of broadband usage, it has been predicted that 10 percent of global Internet users will continue to use dial-up for the foreseeable future.⁴⁹

- Broadband penetration rates vary significantly around the world. In North America the broadband penetration rate is 32 percent, while Europe's is 25 percent, Latin America's is 4 percent, and the Asia-Pacific region's (exclusive of Japan) is 11 percent. Even within Asia, there is a wide variation: China has a broadband penetration rate of 7 percent, Japan's is 38 percent, and South Korea's is 70 percent.⁵⁰
- The fastest-growing region of the world for broadband is the Middle East and Africa, where the number of broadband subscriber lines grew 16.5 percent in the third quarter of 2005.⁵¹
- In the 30 countries of the OECD, as of December 2005, 62 percent of broadband connections were DSL, 31 percent were cable modem, and 7 percent were others (e.g. satellite, fiber, and fixed wireless).⁵²
- Although the U.S. has the largest number of broadband subscribers, it is likely to be surpassed by China during 2006.⁵³
- According to the most recent OECD data, Iceland has the highest broadband penetration rate, followed by South Korea. Ninety percent of South Korea has 3 Mbps broadband at home.⁵⁴ Rates of up to 40 Mbps are available in Japan and South Korea. For comparison, rates in the U.S. are typically 1.5 Mbps or less.⁵⁵

Top Ten Countries by Broadband Subscribers, Year-End 2005

Country	Broadband Subscribers (millions)	Share of World Broadband Population (%)
United States	46.9	21.60
China	35.9	16.50
Japan	26.4	12.20
South Korea	13.1	6.04
France	9.6	4.42
Germany	9.5	4.40
United Kingdom	8.9	4.35
Canada	6.7	4.09
Italy	6.6	3.05
Spain	4.6	2.12

Source: Computer Industry Almanac⁵⁶

Broadband Subscribers per 100 Inhabitants, by Technology, December 2005

Country	Broadband Types			Total	Total Subscribers
	DSL	Cable	Other		
Iceland	25.9	0.1	0.6	26.7	78,017
Korea	13.6	8.3	3.4	25.4	12,190,711
Netherlands	15.7	9.6	0.0	25.3	4,113,573
Denmark	15.3	7.2	2.5	25.0	1,350,415
Switzerland	14.7	8.0	0.4	23.1	1,725,446
Finland	19.5	2.8	0.1	22.5	1,174,200
Norway	17.8	2.9	1.2	21.9	1,006,766
Canada	10.1	10.8	0.1	21.0	6,706,699
Sweden	13.3	3.4	3.6	20.3	1,830,000
Belgium	11.3	7.0	0.0	18.3	1,902,739
Japan	11.3	2.5	3.8	17.6	22,515,091
United States	6.5	9.0	1.3	16.8	49,391,060
United Kingdom	11.5	4.4	0.0	15.9	9,539,900
France	14.3	0.9	0.0	15.2	9,465,600
Luxembourg	13.3	1.6	0.0	14.9	67,357
Austria	8.1	5.8	0.2	14.1	1,155,000
Australia	10.8	2.6	0.4	13.8	2,785,000
Germany	12.6	0.3	0.1	13.0	10,706,600
Italy	11.3	0.0	0.6	11.9	6,896,696
Spain	9.2	2.5	0.1	11.7	4,994,274
OECD	7.3	3.8	0.7	11.7	157,719,880
EU 15	9.6	2.0	0.2	11.8	54,834,506

Source: OECD⁵⁷

Types of Broadband Service

Cable companies were initially more aggressive in promoting their broadband services than phone companies were in promoting DSL, but in 2003, DSL subscribership began to take off. In 2005, there were more new DSL subscribers than cable modem subscribers for the first time, with a total of about 24 million high-speed cable lines and about 17 million high-speed DSL lines in the U.S.⁵⁸ There are several other types of broadband service, including wireless services such as WiMAX and Wi-Fi “clouds,” fiber (“Fiber-to-the-Home” or “Fiber-to-the-Premises”), broadband over power lines (BPL), and EVDO.

- The most recent FCC data is for June 2005, when there were 42.9 million high-speed lines (lines with speeds exceeding 200 kbps in at least one direction) in the U.S., up from 37.9 million lines just six months earlier.⁵⁹
- Of those 42.9 million high-speed lines, 55.8 percent were cable modem, 37.7 percent were asymmetric DSL, 2.1 percent were symmetric DSL, 2 percent were fiber, and 2.3 percent used other technologies.⁶⁰
- Thirty-nine percent of the total number of high-speed connections were from incumbent local exchange carriers (ILECs).⁶¹
- Telecom companies are investing heavily in fiber, which was being deployed in a total of 936 communities in 47 states to deliver broadband services to residential customers as of April 2006, an increase of 280 communities over the previous six months.⁶² As of February 2006, fiber was estimated to pass over 3.6 million U.S. homes, of which 548,000 homes subscribe to the service.⁶³
- Morgan Stanley estimates that, as of mid-2006, there are about 60 million Wi-Fi users and 200,000 Wi-Fi hotspots worldwide, many of which are at Starbucks and McDonald’s locations.⁶⁴ Three-hundred U.S. cities have plans for citywide Wi-Fi networks, including large cities such as Philadelphia and San Francisco. However, it is unknown how well Wi-Fi networks will function over large areas.⁶⁵
- WiMAX operates over larger distances and could become a widely-used alternative broadband platform in the future. WiMAX provides signals that can be received from 30 miles away and offers multiple shared data rates of up to 75 Mbps.⁶⁶
- BPL is another alternative platform that might become more common in the future. BPL has the advantage of using medium-voltage transmission lines which are already in place.⁶⁷
- EVDO (Evolution Data Only or Evolution Data Optimized) gives users wireless broadband access to the Internet in most U.S. metropolitan cities. The technology works with a portable card, and can be used throughout a city, not just within the range of a hotspot.⁶⁸

High-Speed Lines in the U.S., 2000-2005 (thousands)

Technology	2000	2001	2002	2003	2004	2005
ADSL	951.6	2,693.8	5,101.5	7,675.1	11,398.2	16,182.1
SDSL and Traditional Wireline	758.6	1,088.1	1,186.7	1,215.7	1,407.1	905.6
SDSL	n/a	n/a	n/a	n/a	n/a	423.7
Traditional Wireline	n/a	n/a	n/a	n/a	n/a	481.9
Cable Modem	2,284.5	5,184.1	9,172.9	13,684.2	18,592.6	23,938.9
Fiber	307.2	455.6	520.9	575.6	638.8	864.8
Satellite and Wireless	65.6	194.7	220.6	309.0	421.7	970.1
Satellite	n/a	n/a	n/a	n/a	n/a	377.3
Fixed Wireless	n/a	n/a	n/a	n/a	n/a	213.3
Mobile Wireless	n/a	n/a	n/a	n/a	n/a	379.5
Power Line and Other	n/a	n/a	n/a	n/a	n/a	4.9
Total Lines	4,367.4	9,616.3	16,202.5	23,459.7	32,458.5	42,866.5

Data are for June of each year.

High-speed lines are defined as lines with speeds exceeding 200 kbps in at least one direction.

Source: FCC⁶⁹

Projected High-Speed Subscribers in the U.S., 2005-2009 (millions)

	Cable		Fixed		Mobile		Broadband over		Total
	Modem	DSL	Wireless	Fiber	Satellite	Wireless	Power Line		
2005	22.5	17.0	0.6	0.3	0.6	0.2	n/a	41.2	
2006*	25.9	19.3	0.7	0.9	1.0	0.6	0.1	48.5	
2007*	29.4	21.2	0.8	1.6	1.4	1.2	0.2	55.8	
2008*	32.5	22.6	1.1	2.4	1.7	1.6	0.3	62.2	
2009*	35.9	23.8	1.5	3.2	2.2	2.0	0.6	69.2	

* Projections

Source: Telecommunications Industry Association⁷⁰

Top Cable and DSL Broadband Providers, Q1 2006 (subscribers in thousands)

	Cable Broadband Provider					Major Privately Held Cable Companies		Total Cable
	Comcast	Time Warner	Charter	Adelphia	Cablevision			
Subscribers	8,957	5,168	2,322	1,808	1,807	4,190	25,728	
Net Additions	437	346	126	101	112	192	1,408	
	DSL Broadband Providers						Total DSL	
	AT&T	Verizon	Bell South	Qwest	Sprint	Covad		
Subscribers	7,432	5,685	3,145	1,678	777	557	20,172	
Net Additions	511	541	263	180	84	-10	1,658	

Total Subscribers 45,945
Total Net Additions 3,066

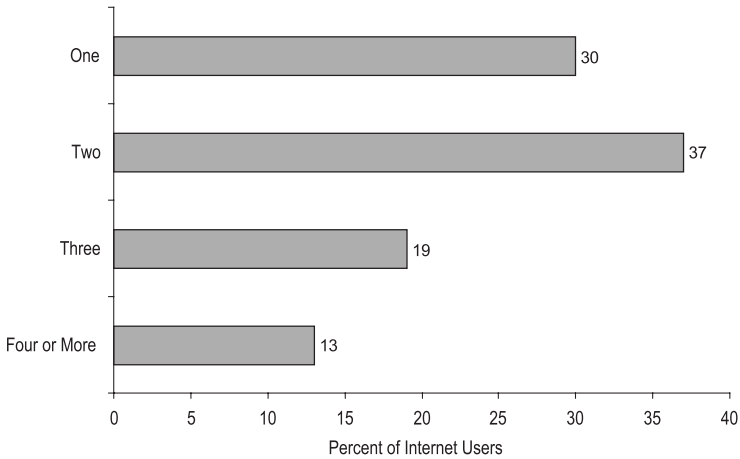
Source: Leichtman Research⁷¹

Email and Instant Messaging

The most common Internet activity is using email, which 91 percent of Internet users do. Forty-seven percent of Internet users use instant messaging (IM).⁷²

- There are approximately 1.1 billion email users worldwide and 1.4 billion active email accounts.⁷³
- Industries related to email are expected to grow rapidly. The email archiving market is expected to grow from \$800 million in 2006 to almost \$7.8 billion in 2010. Over the same period, the installed base of the wireless email market is expected to grow from 14 million to 228 million, and revenue in the Enterprise Instant Messaging market is expected to increase at a 23 percent annual rate.⁷⁴
- As of March 2006, Yahoo! and MSN were the most widely used email providers, each with approximately 230 million unique users per month. AOL Mail and Gmail follow, each with approximately 50 million unique users per month.⁷⁵
- In February 2006, 69 million North Americans (37 percent of the online population in North America) used IM applications to communicate online. By contrast, 82 million Europeans (49 percent of the online population in Europe) used IM in the same month. The region where IM is used most heavily is Latin America, where 64 percent of the online population used it in February 2006.⁷⁶
- As of late 2005, 32 percent of U.S. mobile subscribers use text messaging.⁷⁷ The messaging software market had revenues of \$2.5 billion in 2005, which is expected to grow to \$3.6 billion in 2009.⁷⁸
- Worldwide, MSN Messenger is the most widely used IM application, with 61 percent of the global market, including more than 90 percent of the Latin American market and more than 70 percent the European and Asian Pacific markets. In North America, however, the IM market is more competitive, with MSN Messenger, AOL Instant Messenger, and Yahoo! Messenger each controlling roughly one-third of the market. Although it has yet to gain a large share of the user base in North America, Skype is used by 14 percent of IM users worldwide, including 26 percent of Asia Pacific IM users.⁷⁹

Number of Email Accounts per U.S. Internet User, 2006



Source: Clickz Stats⁸⁰

Email and Search Engine Market Shares, May 2006 (percent)

	Google	MSN	Yahoo!
Search	47.4	11.5	16.0
Email	2.5	22.9	42.4
News	1.9	n/a	6.9
Finance	0.3	13.4	34.9

Source: Guardian Unlimited, Hitwise⁸¹

Mobile Instant Messaging User Bases, December 2005

Client	Users (millions)	Percent of Wireless Subscribers
Yahoo! Messenger	7.9	4.0
AOL Instant Messenger	7.3	3.6
MSN Messenger	4.3	2.1
Google Talk	1.7	<1.0
ICQ Messenger	0.7	<1.0

Source: Tekrati, Telephia⁸²

Competition in Local Phone Markets

The 1996 Telecommunications Act opened up local markets to competition, requiring incumbent local exchange carriers (ILECs) to share their network facilities with new entrants (competitive local exchange carriers, or CLECs).

Several factors have affected the market share of access lines and revenues for “traditional” (i.e., circuit-switched) CLECs. First, the unbundling obligations imposed on ILECs in the wake of the FCC’s *Triennial Review Order* and its associated litigation have diminished, including a phase-out of unbundled switching obligations in mass markets. Second, intermodal competition from wireless and cable companies offering VoIP service is providing very serious competition with the ILECs. Many cable companies that offer VoIP services, such as Comcast and Time Warner, are included in the CLEC data.

- U.S. cable telephony subscribership reached 5.6 million households in 2005⁸³ and worldwide subscribership is predicted to reach nearly 7 million households by the end of 2006.⁸⁴
- TeleGeography estimated that, in the first quarter of 2006, the number of traditional telephone lines dropped by 150,000 a week, while the number of Internet telephone subscriptions increased by 100,000 a week.⁸⁵
- In-Stat predicts that worldwide cable telephony service revenues, which were \$4.5 billion in 2004 and \$5.6 billion in 2005, will reach \$10 billion by 2009. It costs about 17 to 25 percent less to provide service to a VoIP cable telephony subscriber than a traditional circuit-switched cable telephony subscriber.⁸⁶
- According to the FCC, in 2005, the number of CLEC lines continued to increase slowly, and the number of ILEC lines to decrease. At the end of June 2005 CLECs had 34.1 million (19.1 percent) of the 178.2 million end-user switched access lines.⁸⁷
- In 2005, CLECs reported that they provided about 27 percent of their end-user switched lines over local loop facilities they owned, about 56 percent using unbundled network elements (UNEs) leased from other carriers, and about 17 percent through resale arrangements with unaffiliated carriers.⁸⁸
- About 50 percent (4.6 million out of 9.1 million) of the CLECs’ end-user switched access lines used coaxial cable connections in 2005.⁸⁹

End-User Switched Access Lines Reported (millions)

Date	ILECs	CLECs	Total	CLEC Share (%)
December 1999	181.2	8.2	189.4	4.3
June 2000	179.6	11.6	191.2	6.0
December 2000	177.6	14.9	192.4	7.7
June 2001	174.8	17.3	192.0	9.0
December 2001	171.9	19.7	191.6	10.3
June 2002	167.3	21.6	189.0	11.5
December 2002	164.4	24.9	189.2	13.1
June 2003	158.3	27.0	185.2	14.6
December 2003	153.1	29.8	182.9	16.3
June 2004	148.0	32.0	180.0	17.8
December 2004	144.9	32.9	177.8	18.5
June 2005	144.1	34.1	178.2	19.1

CLECs include some companies offering cable telephony.

Source: FCC⁹⁰

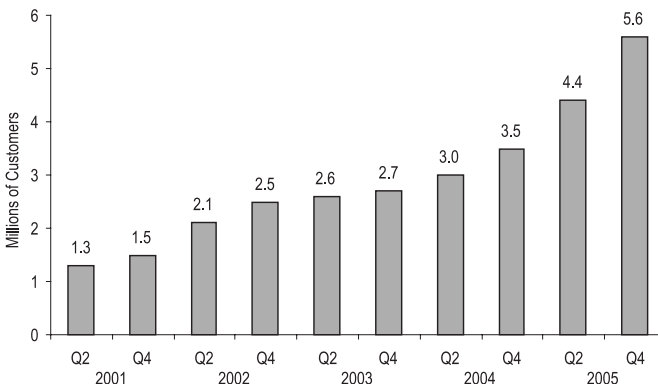
VoIP Rankings by Subscriber, 2006

Provider	Subscribers (thousands)
Skype	1,800*
Vonage	1,600
Time Warner Digital Phone	1,370
Cox Digital Phone	1,300
Comcast Digital Phone	1,300
CableVision	863
CallWave	780
Charter	191
Packet8	133
Insight Communications	100
SunRocket	86

* Paid subscribers as of July 2005.

Source: ISP Planet⁹¹

Residential Cable Telephony Customers, 2001-2005



Source: National Cable & Telecommunications Association⁹²

Chapter 4

Digital Media

The boundaries between television, radio, newspapers, and other forms of media are becoming increasingly blurry because all media can basically be accessed through the Internet, and the Internet can be accessed through an increasingly large variety of means. Although the Internet has perhaps been traditionally associated with “free information,” it is increasingly a source of entertainment as well, for which people are willing to pay. U.S. consumer spending on online entertainment (such as on-demand gaming, music, and video) is expected to increase 260 percent between 2006 and 2010, from \$2.4 billion in 2006 to almost \$9 billion in 2010.¹

In addition to the effects due to the Internet, many media formats have been impacted by digital technologies; AM and FM radio stations now compete with satellite radio, and television viewers have available digital signals through cable, satellite, over-the-air broadcasting, and broadcasting via the Internet.

The growth of online video over the past year is one of the most potentially significant emerging Internet trends. The abundance of broadband connections has allowed more Internet users to view videos online, and television companies are starting to offer their programs for download, usually for small fees, but occasionally for free, paid for through advertisements. YouTube, which allows users to upload and download video, has also seen a surge in usage.

In spite of the availability of high-tech equivalents or near-equivalents for most types of media, many people still seem to prefer traditional methods of receiving or storing information. The sales of digital books never really took off, and CD sales, though dropping, seem less likely to disappear in the near future than recently was thought to be the case. Newspapers and magazines have also managed to maintain most of their audiences despite facing competition from the Internet.

Although there continue to be concerns with how the Internet encourages piracy through peer-to-peer file sharing, recent Supreme Court rulings and the success of several paid online music sites have demonstrated that, as long as property rights are adequately protected, the Internet can be used as a commercial thoroughfare as well as a source of free information.

Television

Television is the dominant media activity in America.² The FCC estimates that in June 2005 there were 109.6 million TV households in America.³ Of these, 94.2 million (86 percent) subscribed to some multichannel video programming distribution service. Of these households, 65.4 million (69.4 percent) received programming from a franchised cable operator, 26.1 million (27.7 percent) received programming from a dish-based satellite company, and 1.4 million subscribers (1.5 percent) received programming from broadband service providers.⁴

- Worldwide growth in the number of cable TV households is expected to be only 4 or 5 percent per year until 2010. The source of much of this growth is expected to be Asia, particularly India. Subscriptions in the U.S. and Western Europe are expected to remain steady or decline slightly.⁵
- In the U.S. in June 2005, there were 1,747 commercial and noncommercial television stations, 1,537 (88 percent) of which were broadcasting with Digital Television (DTV) operations.⁶ There were 531 satellite-delivered national programming networks identified by the FCC.⁷
- North American IPTV (Internet protocol television) subscribers are expected to quadruple between 2005 and 2009. By 2009, worldwide IPTV revenue is expected to hit \$44 billion, and there are expected to be 53 million IPTV customers.⁸
- In 2004, HDTV (high-definition television) sets made up 21 percent of overall TV sales. That number is expected to increase to 70 percent by 2010, when 63 percent of U.S. TV-owning households are expected to have an HDTV set.⁹
- The Digital Living Index is an international survey of consumers' proclivities to adopt new technologies. Generally, U.S. and Canadian consumers were found to be quick to adopt television-related products, while Asian consumers were quick to adopt computer-related products. Europeans were behind North Americans and Asians in both categories.¹⁰

TV Sales Worldwide

	2000	2001	2002	2003	2004	2005*	2006*
Revenue (\$millions)	30,857	30,625	40,760	47,572	52,637	59,543	65,373
Units (thousands)	147,561	149,698	162,038	172,290	183,817	202,035	222,669
Average Selling Price (\$)	209	205	252	276	286	295	294

* Projections

Source: Morgan Stanley¹¹

U.S. Digital Cable Subscriptions

Operator	2004		2005	
	Digital Subscribers (millions)	Percent of Basic Cable Subscribers	Digital Subscribers (millions)	Percent of Basic Cable Subscribers
Comcast	8.6	40	9.1	43
Time Warner	4.8	44	5.1	46
Charter	2.7	45	2.7	45
Cox	2.4	38	2.6	41
Cablevision	1.5	50	1.7	58

Source: FCC¹²

Worldwide DVD Player/Recorder/Device Sales

DVD Player	1997	1998	1999	2000	2001	2002	2003	2004	2005*	2006*
Revenue (\$millions)	320	1,001	2,455	4,169	5,880	4,169	5,880	8,970	8,100	6,860
Units (thousands)	705	2,951	9,704	20,846	35,000	20,846	35,000	78,000	90,000	98,000
Average Selling Price (\$)	454	339	253	200	168	200	168	115	90	70
DVD Recorder	1997	1998	1999	2000	2001	2002	2003	2004	2005*	2006*
Revenue (\$millions)	n/a	n/a	n/a	n/a	341	896	2,200	2,660	2,640	4,250
Units (thousands)	n/a	n/a	n/a	n/a	335	1,105	4,000	7,600	12,000	25,000
Average Selling Price (\$)	n/a	n/a	n/a	n/a	1,018	811	550	350	220	170
VCR	1997	1998	1999	2000	2001	2002	2003	2004	2005*	2006*
Revenue (\$millions)	9,986	9,342	8,755	7,681	5,436	3,925	3,262	2,640	2,491	2,244
Units (thousands)	62,022	62,283	60,801	56,065	54,361	56,065	54,361	48,000	47,000	44,000
Average Selling Price (\$)	161	150	144	137	100	70	60	55	53	51
Digital Still Camera	1997	1998	1999	2000	2001	2002	2003	2004	2005*	2006*
Revenue (\$millions)	576	1,026	1,491	5,193	6,240	7,131	10,329	12,169	10,395	9,315
Units (thousands)	2,311	4,416	6,257	14,098	19,500	27,426	49,185	71,585	77,000	81,000
Average Selling Price (\$)	249	232	238	368	320	260	210	170	135	115

* Projections

Source: Morgan Stanley Equity Research¹³

Internet Video

Over the past year, the increase in broadband access and the adoption of new technologies by content providers have led to phenomenal growth in online video websites. Traffic to the top ten video websites increased 164 percent over a three-month period in early 2006.¹⁴

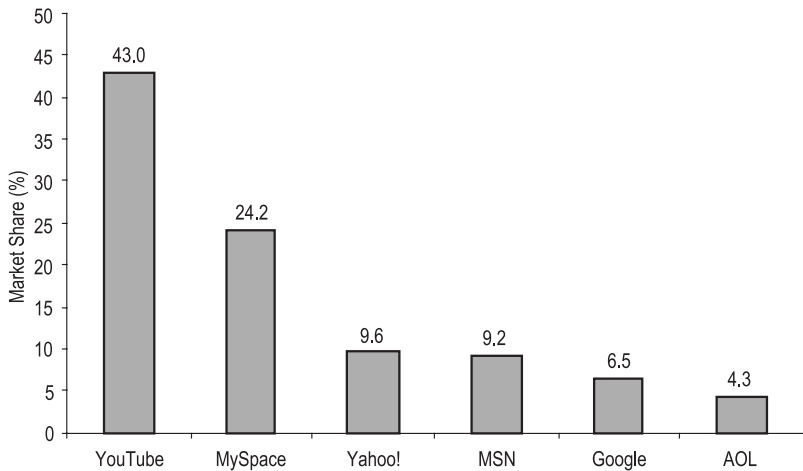
- The availability of online video services took off in late 2005. In October, Disney/ABC and Apple offered episodes of television shows such as *Lost* and *Desperate Housewives* without commercials through iTunes for \$1.99 per episode. In November, Comcast/CBS and DirecTV/NBC followed by offering on-demand TV shows for \$0.99. Time Warner began to stream episodes of new and old series for free, paid for by two-minute blocks of commercials.¹⁵
- In 2005, Internet video services generated approximately \$200 million in revenue, and this figure is expected to grow to \$1.7 billion by 2010.¹⁶
- Insight Research estimates that streaming video and audio accessed through the Internet and mobile devices will create \$27 billion in revenue by 2011.¹⁷
- As much as 40 percent of Internet traffic consists of video P2P file-sharing.¹⁸
- Approximately 8 percent of U.S. households have a DVR, and about 23 percent of all cable subscribers have used Video on Demand.¹⁹
- Although only 2 percent of mobile phone users had a video subscription for their phone as of early 2006, the mobile video industry is expected to grow from \$62 million in 2005 to \$501 million in 2010 according to JupiterResearch.²⁰
- In February 2006, 28 percent of mobile phones in use were capable of playing digital video, but only 1 percent of subscribers did so.²¹
- Almost two-thirds of U.S. Internet users streamed audio or video through a portal in August 2005, and almost 50 percent did so from an entertainment site.²²
- Advertising expenditures on Internet video were \$225 million in 2005, and are expected to grow to \$1.5 billion in 2009.²³

Content that Internet Users Expect to Access Within 12 Months, June 2005 (percent)

	Asia Pacific	Europe	North America	South America
Games	49	15	11	30
Ring Tones	73	20	27	25
Music	55	15	13	28
News	31	15	15	23
Sports Clips	29	12	10	13
Multimedia Images	56	16	13	13
Video Clips	25	7	7	10
Full Feature Films	11	8	3	8

Source: Morgan Stanley²⁴

Top Video Websites, May 2006



Source: IDG News Service²⁵

Radio

The worldwide market for digital terrestrial and digital satellite radio is expected to grow from 5 million unit shipments in 2004 to 22 million unit shipments in 2009, but there will be different drivers for this growth in different countries. In the U.S., the appeal of commercial-free satellite radio is driving the market, but in the U.K., the main force is terrestrial digital audio broadcasting. The Japanese and Korean radio markets saw the recent launch of Digital Multimedia Broadcast services and a corresponding surge in promotional activities.²⁶

- At the end of the first quarter of 2006, the total number of paying subscribers was over 6.5 million for XM Satellite Radio²⁷ and 4.1 million for SIRIUS Satellite Radio.²⁸
- Approximately 6 percent of U.S. radio listeners subscribed to XM or SIRIUS in May 2006—up from 4 percent for XM and 3 percent for SIRIUS in 2005.²⁹
- JupiterResearch predicts that the U.S. digital satellite radio market will grow at a rate of 35 percent annually, from 12 million units in 2005 to 55 million units in 2010.³⁰
- Due to Howard Stern's early 2006 debut, SIRIUS's website attracted 1.9 million visitors in March 2006, an increase of 188 percent from March 2005's 666,000 visitors. XM's website traffic grew 47 percent over the same period, from 1.2 million to 1.7 million visitors.³¹
- The monthly audience of all Internet radio was 52 million in early 2006, an increase of 41 percent over 2005's 37 million.³²
- An April 2006 survey found that 77 percent of Americans believe they will continue to listen to AM/FM radio as much as they do now despite new technologies.³³

Reasons for Purchasing Satellite Radio (percent)

<u>U.S. XM Subscribers</u>		<u>U.S. SIRIUS Subscribers</u>	
Music Channels	24	Howard Stern	32
Commercial-Free	14	Music Channels	19
While Traveling	12	Commercial-Free	12
Came Free With Car	11	Dissatisfied With AM/FM Radio	7
Other	18	Other	15

Source: eMarketer³⁴

Loyalty Metrics for Selected Audio Streaming Sites, March 2006

<u>Site</u>	<u>Sessions per Person</u>	<u>Time per Person (hh:mm:ss)</u>
Rhapsody	3.81	0:18:17
XM Satellite Radio	3.73	0:13:05
Clear Channel Music Radio Network	3.72	0:25:18
SIRIUS Satellite Radio	3.54	0:14:50
MSN Radio	2.72	0:56:05

Source: Nielsen//NetRatings³⁵

Music

Although the music industry is still affected by the ease with which huge numbers of music consumers could download music for free through peer-to-peer (P2P) sites such as Napster in the late 1990s, it is finding ways to adapt to the changing technological landscape. There are several positive trends for the music industry as a whole. iPods and iTunes are proving to be a viable paid alternative to illegal downloading, there are many music consumers who still prefer to own music in CD form, and the market for music as ringtones has grown significantly.

- Total global sales of music fell from \$39.7 billion in 2000 to \$33.6 billion in 2004.³⁶ Worldwide digital sales of music (music sold in downloadable form via the Internet) increased from \$380 million in 2004 to \$1.1 billion in 2005.³⁷ Worldwide online music sales are expected to grow to \$10.7 billion by 2010 according to In-Stat, with roughly 40 percent of that revenue coming from physical media bought online.³⁸
- iTunes had approximately a 70-percent market share of single track downloads in the U.S. in 2005.³⁹
- Online sales of digital music increased from less than 1 percent in 2003 to 6 percent of the total worldwide music market in 2005. The number of downloaded singles paid for was 420 million in 2005,⁴⁰ more than double the number in 2004⁴¹ and more than 20 times the number in 2003.⁴²
- The number of legitimate music download sites in 2005 was 335, up from only 50 in 2003.⁴³
- Consumers have expressed strong preferences for having music available on their phone, whether in entire song form or merely as a ringtone. One study found that consumers are willing to pay more for a 30-second snippet of a song as a ringtone than for the entire song itself.⁴⁴
- States are starting to tax downloaded music, movies, and electronic books; an April 2006 study found that 15 states and the District of Columbia tax these downloads.⁴⁵
- Among Internet users in the United Kingdom, the CD format is nine times more popular than the digital music format for owning music; a 2006 survey in the U.K found that 75 percent of Internet users preferred owning music in the standard CD format, with only 8 percent preferring a downloaded audio file.⁴⁶ Only 5 percent of the respondents to the survey said they bought all of their music in a digital format.⁴⁷

Online Music Company Profiles, 2005

	iTunes	Napster	Rhapsody	Yahoo! Music
Estimated Online Music Market Share				
Pay-Per-Song Market	85% +	-1-2%	-5%	n/a
Online Subscription Market	n/a	-10%	-50%	n/a
Business Model	Pay-Per-Song	Subscription/ Pay-Per-Song	Subscription/ Pay-Per-Song	Subscription/ Pay-Per-Song
Cost for Song/Album	\$0.99/9.99	\$0.99/6.95+	\$0.89/8.99	\$0.79/n/a
Cost for Monthly Subscription	n/a	\$14.95	\$14.99	\$6.99
Number of Songs Available	1.5 million	1 million	1 million	1 million
Number of Songs Downloaded	400 million	n/a	n/a	n/a
Number of Subscribers	n/a	400,000+	1 million	n/a
File Technology	Protected AAC	WMA	MP3,WMA, Unprotected AAC	WMA
Number of Compatible Devices	iPod Only	75	100	13
Inception of Service	2003	2000	2001	2005
2004 Revenue	\$220 million	\$46.7 million	\$266.7 million	n/a
2004 Earnings per Share	Break Even/ Slight Loss	(\$1.43)	(\$0.14)	n/a
Stated Business Goal	Break Even	Profit	Profit	Profit

Source: Morgan Stanley⁴⁸

Top Ten U.S. Online Music Destinations, January 2006

	Unique Audience (thousands)	Active Reach (%)
AOL Music	11,761	9.00
iTunes	10,746	8.22
Yahoo! Music	10,383	7.94
MTV Networks Music	2,427	1.86
MSN Music	2,410	1.84
Clear Channel Music Radio Networks	2,069	1.58
BeMusic	1,547	1.18
Warner Music Group	1,122	0.86
A-Z Lyrics Universe	1,058	0.81
eBay Musical Instruments	903	0.69

Source: Media Post⁴⁹

U.S. and European Digital Music Markets

	United States			Europe		
	2004 (millions)	2005 (millions)	Change (%)	2004 (millions)	2005 (millions)	Change (%)
Broadband Lines	34	43	26	43	63	46
Single Tracks Downloaded	143	353	147	14	62	355
Album Downloads	6	16	193	150	200	33
Mobile Subscriptions	163	174	7	5	18	255

Source: International Federation of the Phonographic Industry⁵⁰

Gaming

The gaming industry has exhibited less volatility than most other technology-related industries over the past several years, growing slowly but steadily. Although technological advances certainly have improved the quality and diversity of games, there have not been as many major changes in the economics of the industry as there have been in other sectors of the digital economy.

- As of April 2006, there are an estimated 100 million current-generation gaming devices in the U.S., spread among 40 million households.⁵¹ According to the NPD Group, retail sales of video games in the U.S. in 2005 reached \$10.5 billion, a 6-percent increase from the \$9.9 billion in sales in 2004.⁵² According to the Entertainment Software Association, U.S. sales of computer and video game software reached \$7 billion in 2005, more than double that of 1996.⁵³
- Gaming appeals to a wide variety of age groups. According to a December 2005 Consumer Electronics Association survey of 1,767 adult video game households, one-third of adults spend ten or more hours playing games in a week, while only 11 percent of teenagers do so.⁵⁴
- In 2005, in-game advertising (digital ads placed inside video games) accounted for \$56 million of spending (up from \$34 million in 2004), but this amount is expected to increase dramatically in the future. Estimates of total in-game advertising in video games in 2010 range from about half a billion dollars to almost \$2 billion.⁵⁵
- Worldwide subscription revenue from online gaming reached \$2 billion in 2005 and is expected to increase to \$6.8 billion by 2011. Over half of the revenue in 2005 was from Asian countries other than Japan.⁵⁶
- In-Stat predicts that the Sony PS3 will account for about 50 percent of the installed base of next-generation consoles through 2010, with the Microsoft Xbox 360 at number two with 28.6 percent and the Nintendo Revolution with 21.2 percent. The Sony PS3 will have Blu-Ray DVD playback, a high definition type of DVD that is an important component of Sony's overall corporate strategy.⁵⁷
- As of April 2006, there have been 101 million PlayStation 2's sold worldwide, compared with 24 million Microsoft Xbox's and 21 million Nintendo Gamecubes. In the U.S., the Playstation 2 has a market share of 55 percent.⁵⁸
- The gaming console market is expected to become more competitive in the future; Wedbush Morgan Securities said in 2005 that it expected worldwide PlayStation 3 and Xbox 360 sales to be tied at 23 million units sold annually in 2007.⁵⁹

Top Five Video Game Titles, Ranked by Units Sold in the U.S. in 2005

Rank	Title	Platform	Publisher	Release Date	ARP
1	Madden NFL 06	PS2	Electronic Arts	Aug-05	\$46
2	Pokemon Emerald	GBA	Nintendo of America	Apr-05	\$34
3	Gran Turismo 4	PS2	Sony Computer Ent.	Feb-05	\$49
4	Madden NFL 06	XBX	Electronic Arts	Aug-05	\$47
5	NCAA Football 06	PS2	Electronic Arts	Jul-05	\$48

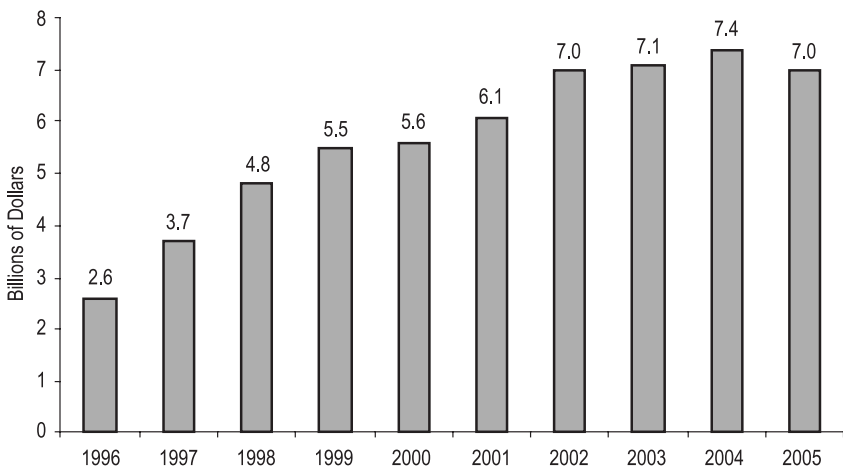
Source: NPD Group⁶⁰

Top Five PC Game Titles, Ranked by Units Sold in the U.S. in 2005

Rank	Title	Publisher	Intro. Date	ARP
1	World of Warcraft	Vivendi Universal	Nov-04	\$47
2	The Sims 2: University Expansion Pack	Electronic Arts	Feb-05	\$33
3	The Sims 2	Electronic Arts	Sep-04	\$45
4	Guild Wars	Ncsoft	Apr-05	\$48
5	Roller Coaster Tycoon 3	Atari	Oct-04	\$30

Source: NPD Group⁶¹

U.S. Computer and Video Game Sales



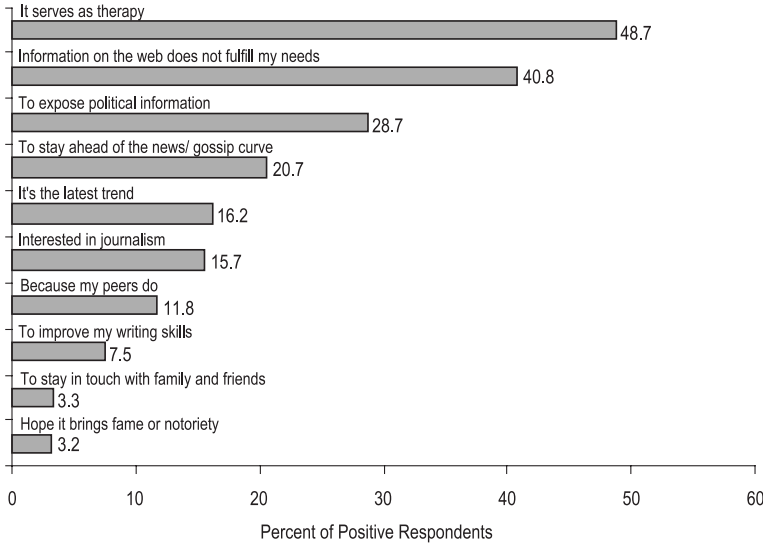
Source: Entertainment Software Association⁶²

Blogging

As of April 2006 there were an estimated 35.3 million weblogs in existence. Since early 2003, the “blogosphere” has doubled in size approximately every six months and is now 60 times as large as it was three years ago.⁶³

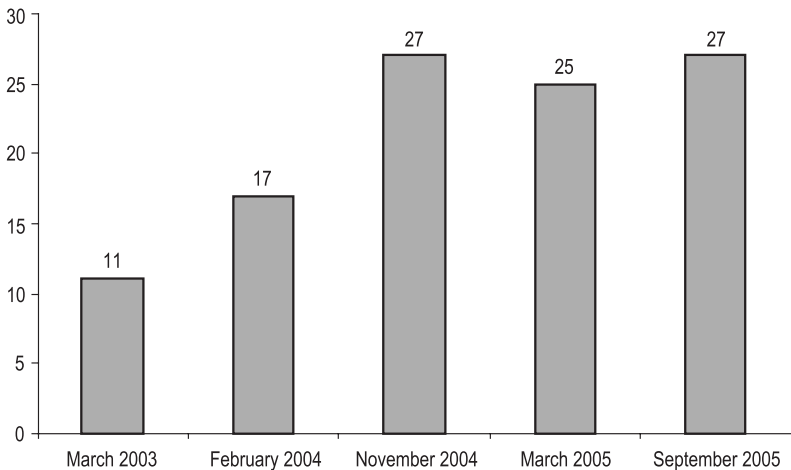
- Technorati estimates that as of April 2006, 75,000 new weblogs are created each day, but about 45 percent of blogs are not maintained after three months.⁶⁴
- There are an average 1.2 million legitimate blog posts per day, or about 50,000 per hour.⁶⁵
- According to a 2006 Gallup survey of Americans’ online habits, about one out of every five Web users reads blogs frequently or occasionally, which puts blog reading at the bottom of the list of 13 Internet activities included in the survey. Although Americans are spending more time online, they don’t seem to be spending more time reading blogs.⁶⁶
- The blog analog to spam is “splog.” A splog looks like a blog but contains mostly commercial, promotional, and/or stolen text. Spam-related blogs account for about 9 percent of new blogs.⁶⁷

Primary Reasons for Blogging Among U.S. Bloggers



Source: eMarketer⁶⁸

Percent of U.S. Internet Users Who Read Blogs



Source: Business Week Online⁶⁹

Online News

Print newspapers and magazines can't compete with online news sources for being up-to-the-minute, and many believed that the Internet could cause the end of the traditional morning newspaper. Although newspapers and magazines have become less able to provide the most recent information, their subscriberships have not declined as significantly as may have been expected; daily circulation of American newspapers as of mid-2006 is 45.5 million, 2.5 percent lower than a year ago,⁷⁰ indicating that many Americans have remained loyal to printed news. Meanwhile, the Internet has engendered a wide variety of news sources that offer continuously updated and free information for those who want it.

- In October 2005, newspaper websites had 39.3 million unique visitors (about one-quarter of the online population), an 11-percent year-over-year increase.⁷¹
- As of March 2006, about 50 million American adults got news online on a typical day.⁷²
- As of April 2006, in the course of a week, 55 million people visit newspaper websites, while 116 million pick up a newspaper.⁷³
- In 2005, the number of unique visitors to online newspaper sites increased 21 percent, and individual page views increased 43 percent.⁷⁴
- In a survey of engineers, it was discovered that North Americans believe printed information sources are more reliable and credible, while Asians and Europeans put more stock in online information sources.⁷⁵
- A recent survey indicated that the Internet is not as much of a threat to print news publications as it is an opportunity to reach more readers through a different channel; newspapers with strong web activities have shown strong circulation growth.⁷⁶ Online revenues of U.S. newspapers grew from \$1.03 billion in 2004 to \$1.4 billion in 2005, and they are expected to reach \$2.26 billion by 2008.⁷⁷
- Online media produce 20 to 100 times less revenue per reader than newspapers.⁷⁸
- According to the Pew Internet and American Life Project, approximately 25 percent of the increase in U.S. daily online news consumption that has taken place since 2002 is due to the increase in broadband adoption in homes.⁷⁹

Online and Offline Newspaper Consumption, November 2005

Newspaper Consumption Habit	Percent of Online Adults
Primarily Print Newspaper Reading	71
Primarily Online Newspaper Reading	22
Split Between Print and Online Newspaper Reading	7

Source: Nielsen//NetRatings⁸⁰

Top Ten Newspaper Websites, October 2005

Newspaper site	Unique Audience (thousands)	Year-Over-Year Change (%)
NYTimes.com	11,405	15
USATODAY.com	10,361	8
WashingtonPost.com	8,067	28
LA Times	3,934	23
SFGate.com	3,922	4
Boston.com	3,602	-1
Daily News Online Edition	2,870	5
Wall Street Journal Online	2,665	9
The Houston Chronicle	2,654	35
Chicago Sun-Times	2,584	20

Source: Nielsen//NetRatings⁸¹

“Where People Got Their News Yesterday,” December 2005 (percent)

	All Respondents	Non-Internet Users	Dial-Up Users	Broadband Users
Local TV	59	57	65	57
National TV	47	43	50	49
Radio	44	34	52	49
Local Paper	38	37	41	38
Internet	23	n/a	26	43
National Paper	12	8	12	17

Source: Pew Internet & American Life Project⁸²

Chapter 5

Electronic Commerce

Despite the IT-sector meltdown between 2000 and 2002, electronic commerce has become an increasingly important part of the U.S. economy. Americans are using the Internet for commercial purposes, including shopping for and purchasing the full range of consumer goods, arranging travel, banking, and trading stocks.

In 2005, online sales (including travel) were \$176.4 billion, an increase of 25 percent over 2004. Online sales excluding travel were \$113.6 billion. Online sales (including travel) in 2006 are expected to reach \$211.4 billion, a 20-percent increase over 2005. Online sales excluding travel are expected to reach \$138 billion in 2006. The two fastest-growing categories are expected to be pet supplies and cosmetics and fragrances.¹

Leading online sales destinations, such as Amazon and eBay, are among the strongest firms serving the business-to-consumer (B2C) market. In addition, more “bricks and mortar” retailers have developed successful “bricks and clicks” operations that depend on Internet presence in addition to traditional retail space.

The much larger Internet business-to-business (B2B) market continues to grow rapidly. E-marketplaces have emerged that enable firms to buy and sell goods more efficiently, reducing the costs of effecting transactions and enabling firms to collaborate more productively through supply chain management.

In mid-2005, the 18 percent of the U.S. online buying population who spent the most money online were responsible for 46 percent of online spending.² In addition to the increase in online purchases, Internet users are also selling things online more than in the past. As of late 2005, about 17 percent of U.S. Internet users (25 million people) have sold something online.³

Business-to-Consumer and Business-to-Business E-Commerce

According to the U.S. Census Bureau, U.S. total retail sales (business-to-consumer) reached \$976.1 billion in the first quarter of 2006, of which \$25.2 billion (2.6 percent) was e-commerce.⁴ The most recent annual data from the Census Bureau are for 2004, when e-commerce made up 20.1 percent of total business-to-business revenues (\$1.8 trillion of \$9.1 trillion), compared with only 1.5 percent of business-to-consumer revenues (\$0.13 trillion of \$8.9 trillion).⁵

- Business-to-consumer e-commerce grew 21.5 percent from 2003 to 2004, compared with 13.9-percent growth for business-to-business e-commerce over the same period.⁶
- A Shop.org-Forrester Research Study concluded that online retail sales (including travel) would reach \$211.4 billion in 2006.⁷
- Total online consumer spending (including travel) during the holiday season (November and December) of 2005 reached \$28.2 billion, a 22-percent increase over 2004's \$23.1 billion for the same period.⁸
- Internet usage is affecting offline as well as online commerce. comScore found that, of the people who purchased an item related to their search query, 63 percent purchased the item offline.⁹
- JupiterResearch predicts that 71 percent of Internet users will use the Internet to shop in 2010, a modest increase from 2005's 65 percent. However, in 2010 the Internet is expected to "influence" almost half of total retail sales, a significant increase over 2005's 27 percent.¹⁰
- In December of 2005, the Fathom Online keyword price index, which tracks prices for the top spots for the 500 most queried searches in a variety of industry categories, was highest for the mortgage industry, at \$3.30, with the investing, broadband, and automotive industries following at \$1.60, \$1.56, and \$1.52, respectively.¹¹

Estimated Quarterly U.S. Retail Sales

Quarter	Retail Sales (\$millions)		E-Commerce as a Percent of Total
	Total	E-Commerce	
Q1 2006*	976,110	25,218	2.6
Q4 2005	946,069	23,569	2.5
Q3 2005	943,540	22,656	2.4
Q2 2005	923,223	21,410	2.3
Q1 2005	902,564	20,118	2.2
Q4 2004	891,614	19,146	2.1
Q3 2004	870,916	18,024	2.1
Q2 2004	855,616	17,091	2.0
Q1 2004	847,417	16,407	1.9
Q4 2003	830,341	15,372	1.9
Q3 2003	828,828	14,630	1.8
Q2 2003	805,125	13,679	1.7
Q1 2003	800,063	12,772	1.6
Q4 2002	791,997	12,317	1.6
Q3 2002	790,081	11,559	1.5
Q2 2002	779,761	10,835	1.4
Q1 2002	773,165	10,094	1.3
Q4 2001	785,912	9,419	1.2
Q3 2001	759,464	8,314	1.1
Q2 2001	765,398	8,394	1.1
Q1 2001	756,906	8,254	1.1
Q4 2000	753,134	7,876	1.0
Q3 2000	748,083	7,353	1.0
Q2 2000	741,410	6,495	0.9
Q1 2000	742,622	5,838	0.8
Q4 1999	724,737	4,615	0.6

* Projections

Source: U.S. Census Bureau¹²

Value of U.S. Sales and E-Commerce

	2003			Year-over-Year Change (%)	
	Total (\$billions)	E-Commerce (\$billions)	E-Commerce as a Percent of Total	Total	E-Commerce
Total	16,740	1,706	10.2	7.6	14.4
Business-to-Business	8,360	1,599	19.1	8.4	13.9
Business-to-Consumer	8,380	107	1.3	6.8	21.5

	2004			Year-over-Year Change (%)	
	Total (\$billions)	E-Commerce (\$billions)	E-Commerce as a Percent of Total	Total	E-Commerce
Total	18,010	1,951	10.8	7.6	14.4
Business-to-Business	9,059	1,821	20.1	8.4	13.9
Business-to-Consumer	8,951	130	1.5	6.8	21.5

Source: U.S. Census Bureau¹³

Online Advertising

The total advertising market in the U.S. in 2005 was \$240 billion, a 3.9-percent increase from 2004. Internet advertising has been the fastest-growing component of total advertising, averaging 57-percent annual growth over the past 10 years, though growth was only 24 percent from 2004 to 2005. Over the past year, satellite radio advertising revenue grew a whopping 235 percent, with interactive TV ad revenue growing 116 percent.¹⁴

- Online advertising is used by 80 percent of advertisers.¹⁵
- Parks Associates expects Internet advertising's share of total advertising in the U.S. to grow from 5 percent in 2004 to 10 percent in 2010.¹⁶
- Internet advertising revenues were \$12.5 billion in 2005, up 30 percent from 2004.¹⁷
- Advertisers in the U.S. and Canada spent \$5.75 billion on Search Engine Marketing (SEM) in 2005, which was a 44-percent increase over 2004's amount. The SEM industry is expected to reach \$11 billion by 2010.¹⁸
- Search engine advertising spending is predicted to grow 26 percent in 2006, while print advertising spending is expected to grow only 3.3 percent and TV/Radio advertising spending only 2.4 percent. Total online marketing spending is expected to grow 19 percent in 2006.¹⁹
- Google has a reputation for being more effective than Yahoo! and MSN in keyword ads.²⁰
- In spite of the growth in online advertising, the top three most effective tactics for branding and lead generation are trade magazines, events, and direct mail.²¹
- Worldwide local search revenues from sites such as the Internet Yellow Pages are expected to grow from \$3.4 billion in 2005 to \$13 billion in 2010, a 30.5-percent annual increase. The offline counterpart, print Yellow Pages, is expected to increase a modest 1.5 percent over the same period, from \$26.3 billion in 2005 to \$28.4 billion in 2010. Global classified advertising revenues are expected to drop 0.2 percent per year, from \$79.5 billion in 2005 to \$78.5 billion in 2010.²²

Online Advertising by Industry, March 2006

Industry	Impressions (thousands)		Share of Industry Advertising (%)		Share of All Advertising (%)	
	Sponsored	All Image-Based	Sponsored	All Image-Based	Sponsored	All Image-Based
	Link	Advertising	Link	Advertising	Link	Advertising
Automotive	292,666	3,944,751	7	93	0	2
Business to Business	2,669,459	4,405,573	38	62	4	2
Consumer Goods	1,822,396	6,082,741	23	77	3	3
Cross Industry	824,332	0	100	0	1	0
Entertainment	356,356	6,509,298	5	95	1	3
Financial Services	4,937,384	58,384,652	8	92	7	30
Hardware & Electronics	470,721	4,537,173	9	91	1	2
Health	911,498	3,427,429	21	79	1	2
Public Services	2,160,902	10,955,344	16	84	3	6
Retail Goods & Services	14,032,233	28,382,372	33	67	21	14
Software	1,044,907	4,348,776	19	81	2	2
Telecommunications	873,170	33,285,223	3	97	1	17
Travel	3,148,898	5,666,771	36	64	5	3
Unclassified Text Advertising	16,499,687	0	100	0	25	0
Web Media	15,921,017	27,860,913	36	64	24	14
Total	65,965,626	197,791,016	25	75	100	100

Source: Media Post²³

Top 25 Internet Advertisers by Media Value, April 2006

Rank	Advertiser	Media Value (\$thousands)
1	Vonage	19,654
2	Monster	11,330
3	Classmates.com	10,915
4	Dollar Rent A Car	9,691
5	Ameritrade	8,144
6	Netflix	7,948
7	Scottrade	7,630
8	Forex Capital Markets	7,428
9	Fidelity Investments	7,210
10	Cingular Wireless	6,211
11	Dell VAR Computers	6,109
12	Dell Dimension Computers	5,895
13	FreeCreditReport.com	5,515
14	University of Phoenix Online	5,498
15	MLB.TV	5,469
16	HomePages	5,282
17	E*Trade Financial	5,270
18	Amazon.com	4,367
19	HP Printers	4,079
20	Wal-Mart	4,052
21	Dice	3,879
22	LowRateSource.com	3,793
23	Target.com	3,762
24	Verizon Wireless	3,554
25	Charles Schwab	3,520

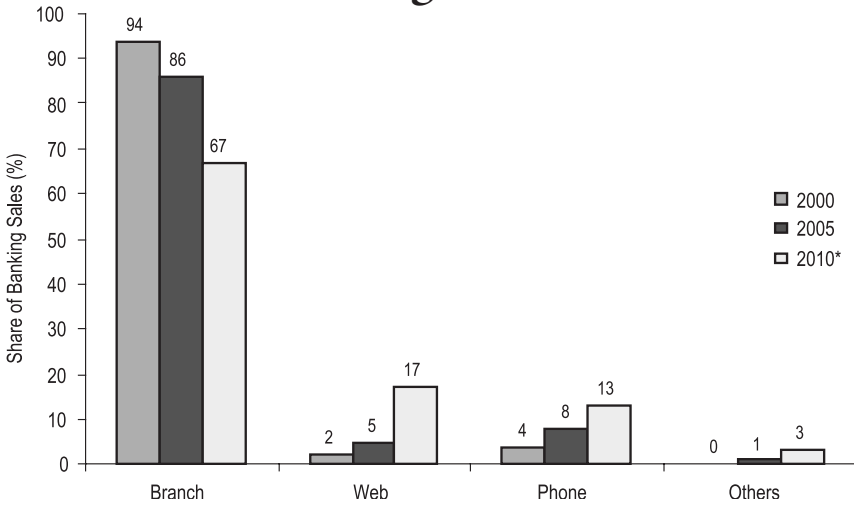
Source: Clickz Stats²⁴

Online Finance

A comScore report found that 40 million Americans were online banking customers in the last quarter of 2005, a 27-percent increase from a year earlier. Still, the rate of adoption is slowing; there was a mere 3.1-percent increase since the previous quarter, the lowest increase in three years. Over the next few years, the number of online banking households is expected to grow only 4 percent per year, from 45.4 million in 2006 to 56.2 million in 2010.²⁵

- Pew found that 43 percent of Internet users—about 63 million American adults—bank online.²⁶
- The proportion of Internet users who go online to obtain financial information such as interest rates or stock quotes has remained constant from 2000 to 2005 at about 44 percent.²⁷
- Seventy-five percent of Europeans do more than half of their banking online, while only 38 percent of Americans do.²⁸ The differences between the number of security breaches and the perceived threat of identity theft between the two regions are probably the main reasons for the disparity.²⁹ However, most experts believe that identity theft is extremely unlikely to occur from using online banking services.³⁰
- Wachovia had the highest ratings in a recent survey of customer satisfaction with online banking, followed closely by Bank of America, Wells Fargo, and Chase/Bank One.³¹
- Bill payment by using online banking services has been growing rapidly and, as of April 2006, accounts for about a quarter of all online bill payments.³²
- The worldwide ATM market had revenues of \$2.21 billion in 2005, and this amount has been predicted to reach \$2.88 billion in 2010. ATM usage has been consistent over the past few years, and is expected to be consistent in the future as well. China, Brazil, and India are the fastest-growing markets, with India's ATM industry doubling every year. However, ATM fraud is a problem that threatens to undermine the strength of the industry.³³

Distribution of Banking Sales Among Channels

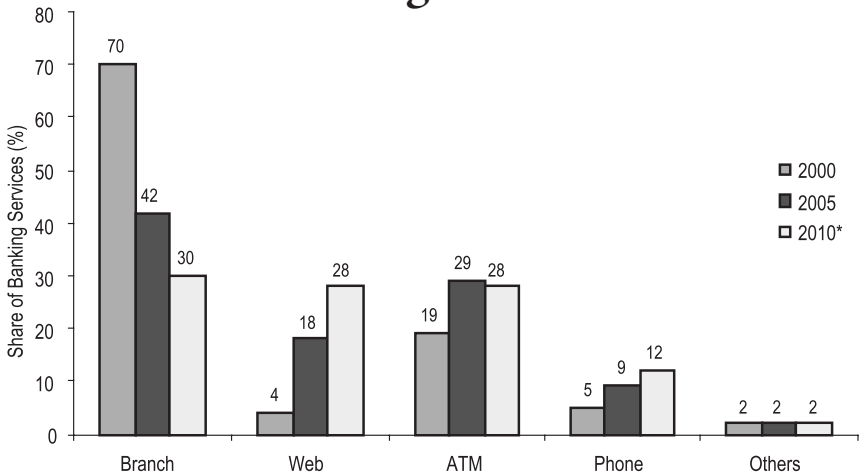


Sales: the closing stage of the process only (excluding pre-sale steps such as simulation and information-gathering).

* Projections

Source: Capgemini, EFMA, and ING³⁴

Distribution of Banking Services Among Channels



Services: day-to-day banking transactions such as cash withdrawals, cash and check deposits, wire transfers, printing bank statements, ordering check books, providing technical assistance, resolving incidents and complaints, and locating documents.

* Projections

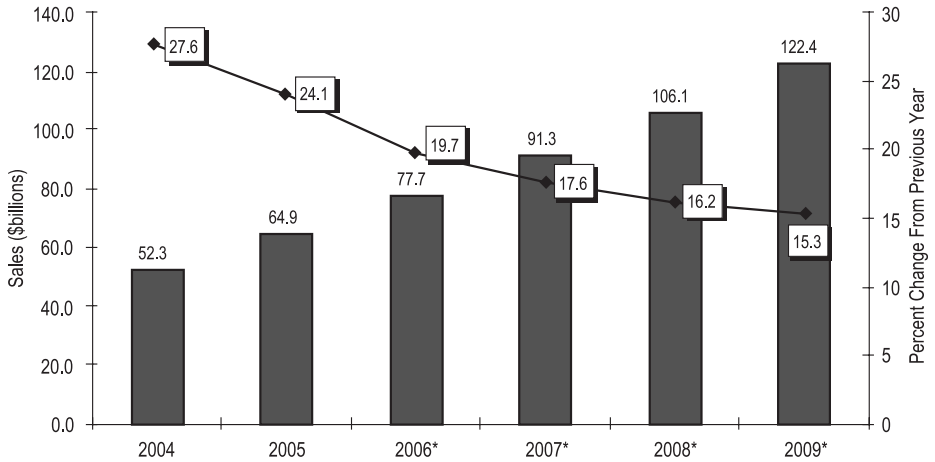
Source: Capgemini, EFMA, and ING³⁵

Online Travel

After the events of September 11, 2001, the travel industry as a whole saw a downturn in revenues for a while. But then the industry started growing again, and the number of people flying in America is approximately the same as it was prior to September 11, 2001.³⁶

- In the U.S., 54 percent of consumers start planning their trips using an online travel site such as Expedia, Travelocity, or Orbitz; 37 percent start on a hotel or airline company site; and 9 percent start on a website run by travel-search firms, such as Sidestep.com or Kayak.com.³⁷
- U.S. online travel bookings grew 19 percent in 2005 relative to 2004.³⁸
- According to Jupiter Research, online travel sales will make up about 25 percent of all bookings in 2006—the figure was 15 percent three years earlier. By 2009 it is expected to be about 33 percent.³⁹
- Nearly 150 million consumers visited a travel website in 2005, which is a 35-percent increase over the 2004 figure. Online travel revenues were \$60 billion in 2005, which was a 20-percent increase over the 2004 amount.⁴⁰
- In 2006, supplier travel sites (sites of specific car rental companies or hotel chains, for example) began to take shares away from travel sites such as Expedia, Orbitz, and Travelocity, the three leading travel websites.⁴¹
- The leading airline sites in 2005 in terms of the online customer experience and customer acquisition were Southwest, American, and JetBlue, with Southwest leading for the second year in a row. Only Southwest and JetBlue could compete with the online travel sites on price satisfaction.⁴²
- Growth in the travel industry outside of the U.S. has been strong. Europeans have more vacation time, and are thus more likely to use online travel sites. Asia has a burgeoning middle class whose members are often tech-savvy, price-conscious, and especially eager to travel internationally since doing so had been prohibitively difficult and expensive in the past. According to the *China Daily* newspaper, Chinese international travel has grown more than fifty-fold in the past 20 years. In addition, India's airline liberalization has resulted in air travel abroad growing almost 50 percent per year over the last few years.⁴³

U.S. Online Leisure/Unmanaged Business Travel Sales, 2004-2009



* Projections
Source: eMarketer⁴⁴

Top Ten Travel Sites, April 2006

Rank	Web site	Unique Visitors (thousands)
1	Expedia Inc.	27,319
2	Trip Network Inc.	16,296
3	Orbitz	15,197
4	Travelocity	13,248
5	Southwest Airlines Co.	11,435
6	Yahoo! Travel	9,685
7	Priceline.com	8,107
8	American Airlines	6,135
9	AOL Travel	5,846
10	Delta Airlines	5,546
Travel Category		77,584
Total Internet Audience		171,690

Source: Fact Monster⁴⁵

Chapter 6

Threats to the Digital Economy

The Internet and other new technologies are changing the way the economy works, and as such, they represent an important opportunity for all legitimate businesses. However, since the technologies are new, there are also numerous possibilities for criminals to exploit them, and the inevitable delay in the ability of law enforcement to catch up with new technologies can compound the problems.

Broadly, the threats covered in this chapter can be divided into two categories: those whose perpetrators are intentionally harming the welfare of others for financial or political gain (examples include viruses, spyware, identity theft, and keylogging), and those whose perpetrators are merely overzealous and nondiscriminating marketers (spam is the main example of this).

Piracy doesn't fit into this dichotomy very well; in some countries, its perpetrators are often not violating any laws, and for most countries, the crimes only recently began to be enforced, if at all. However, the harm that comes from piracy (it is essentially a form of theft) makes it as much of a problem as most of the other threats covered in this chapter.

It is ironic that all of these threats *to* the digital economy use technologies that resulted from technological advances *by* the digital economy. Spam is a form of email, piracy depends heavily on illegal downloading and CD replication technology, and viruses are usually spread through the Internet. Although they still pose challenges, there has been success in the past several years in reducing the harmful effects of these threats.

Viruses

A computer virus is a self-replicating computer program that inserts copies of itself into code or documents. Viruses are a type of malware, and they can include worms and Trojan horses.

- The number of Trojan-borne email messages increased in 2005, as virus writers seem to have shifted from using mass-mailed viruses to targeted Trojans through botnets (a collection of software “robots” that run automatically).¹
- In the first quarter of 2006, 18.1 percent of U.S. computers were zombies, compared with 44 percent in the second quarter of 2004.² Zombies are PCs that have been infected by viruses.
- Worldwide network security appliances and software revenue was \$4.3 billion in 2005, an increase of 15 percent over the 2004 figure. This figure is forecasted by Infonetics to reach \$5.7 billion in 2009.³
- Some viruses can spread between smartphones that are linked to computers,⁴ though no cell phone viruses have been developed.⁵
- The most harmful viruses also tend to be the ones that work the fastest; Commtouch Detection Center found that the average distribution time of low intensity attacks was 27 hours, but that massive attacks take as few as 5.5 hours to spread via millions of emails.⁶

Worldwide Antivirus-Software Leaders, August 2005

Company	Unit Volume Share (%)	Dollar Volume Share (%)	Average Price (\$)
Symantec	82.3	80.0	36.84
McAfee Inc.	11.1	13.7	47.05
Trend Micro	4.9	5.0	38.15
Computer Associates	1.5	1.0	25.54
Intego	0.1	0.1	59.83

Source: Business Week Online⁷

Security Software Revenue (\$billions)

Type of Security Software	2003	2004	2005*	2006*	2007*	2008*
Antivirus	2.7	3.2	3.6	4.1	4.5	4.9
Identity & Access Management	2.2	2.3	2.6	2.9	3.2	3.6
Messaging Security	0.4	0.6	0.8	1.1	1.4	1.7
IDS/IPS	n/a	0.4	0.4	0.4	0.4	0.4
Firewall/VPN	n/a	1.0	1.0	1.1	1.2	1.2
Web Filtering	0.3	0.4	0.5	0.6	0.8	0.9
Vulnerability Assessment	0.4	0.5	0.6	0.7	0.8	0.9
Authentication	0.3	0.4	0.4	0.5	0.5	0.6
Worldwide Security Software Revenue	7.9	8.8	10.0	11.3	12.7	14.2

* Projections

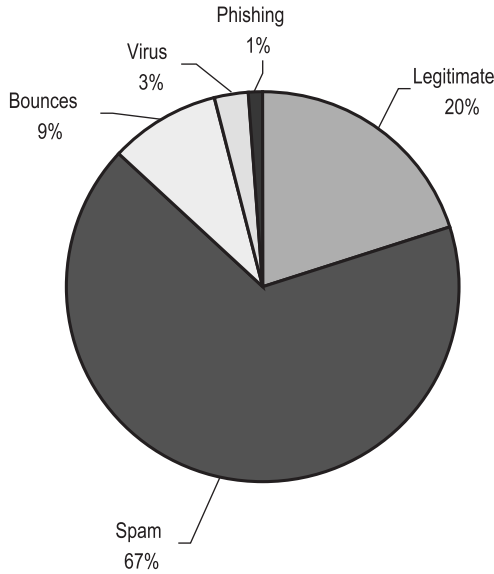
Source: Morgan Stanley Equity Research⁸

Spam

Although it has sometimes been regarded as a major threat to the digital economy, junk email, or “spam,” has become less of a problem than in the past due to improvements in email filtering capabilities and an increased awareness among email users. Whereas spam was once a viable (though annoying) way for sellers to reach potential buyers, many of those sellers are turning towards more targeted techniques.⁹

- The average email user received 3,253 pieces of spam in 2005, but is expected to receive only 1,640 pieces of spam in 2010.¹⁰
- In 2005, it is estimated that 68.6 percent of email messages were spam, compared with 72.3 percent in 2004.¹¹ However, estimates of the percentage of email that is spam vary widely depending on the source.
- At least 20 percent of the email addresses on spammers’ lists are out-of-date, which has created a new problem: bounced email, which is estimated to cost companies \$5 billion per year in IT resources.¹² Nine percent of email volume is misdirected or “bounced” email.¹³
- Email delivery rates have stabilized at around 88 percent and are expected to surpass 90 percent over the next few years.¹⁴
- JupiterResearch estimates that the cost of incorrectly blocked email is expected to be \$107 million in 2006, but is expected to fall to \$92 million by 2010.¹⁵

Types of Email Sent, March 2006



Source: Clickz Stats¹⁶

Spam Origins and Contents, February 2006

<u>Country of Origin</u>	<u>Percent</u>	<u>Spam Content</u>	<u>Percent</u>
United States	43.70	Pharmaceutical	52.22
China	13.63	Enhancers	15.52
Germany	3.90	Gifts	14.41
Republic of Korea	3.78	Finance	8.09
France	2.70	Porn/Software/Misc.	9.76
United Kingdom	2.57		

Source: Clickz Stats¹⁷

Spyware

Spyware can be defined as software that is placed surreptitiously on a computer in order to monitor the user's behavior and report that information back to a central source.¹⁸

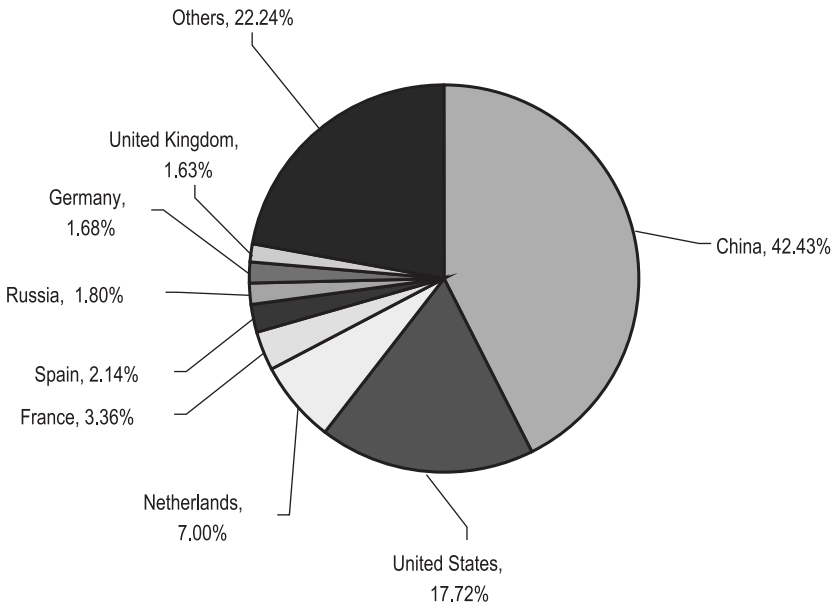
- In the first quarter of 2006, the total number of identified sites hosting spyware was 427,000.¹⁹ According to a Webroot survey, more than 50 percent of small and medium-sized businesses experienced a spyware attack during the first quarter of 2006.²⁰
- According to a Pew survey, 43 percent of Internet users say they have had a spyware program on their home computer, but the actual number of users whose computers are affected is probably much higher.²¹
- Ninety-one percent of Internet users say they have made at least one change to their online behavior in order to avoid getting undesirable software like viruses and spyware on their computer.²²
- In a Pew survey, 48 percent of the people who tried to alleviate spyware-related problems with their computer said the problem was fixed quickly and easily, 31 percent said it was fixed after substantial time and effort, and 20 percent said the problem was never solved.²³
- Anti-spyware software that tracks cookies, used by about 32 percent of Internet users, is a threat to companies that use third-party cookies.²⁴
- According to a Webroot survey, the U.S. had the highest incidence of spyware detected by spyware scans in the first quarter of 2006, with 34 per scanned PC.²⁵
- There was a significant increase in overall infection rates (spyware, Trojans, and adware) in the first quarter of 2006. Webroot had three possible explanations for this growth: new spyware distribution methods, new research technologies, and increased utilization of opportunities posed by the adware industries.²⁶

Worldwide Consumer PC Infection Rate Estimates

	Percent of Consumer PCs Infected with Spyware	Percent of Consumer PCs Infected with Trojans	Percent of Consumer PCs Infected with Adware
Q1 2004	90	17	83
Q2 2004	90	14	82
Q3 2004	89	12	77
Q4 2004	92	16	73
Q1 2005	88	21	64
Q2 2005	83	19	52
Q3 2005	72	21	39
Q4 2005	72	24	45
Q1 2006	87	29	59

Source: Webroot Software²⁷

Spyware Sites by Country, Q1 2006



Source: Webroot Software²⁸

Piracy

Software, music, and movies are the main types of intellectual property that can be pirated. Although recent Supreme Court rulings have helped to thwart piracy of music via file-sharing sites, there are still many sites that make it easy for music consumers to download copyrighted works without paying for them. Piracy is an international problem, with the vast majority of music, movie, and software piracy occurring outside the U.S. Although steps have been taken to improve the situation, piracy rates are still extremely high in most developing countries.

- Intellectual property infringement has been estimated to cost the U.S. economy about \$250 billion per year.²⁹
- With copyright industries worth about 5 percent of the U.S. and European economies and about \$1 trillion globally, piracy of software, video, and music is a major threat to these components of the digital economy.³⁰
- In 2005, 35 percent of the packaged software installed on computers worldwide were illegal copies, and this amounted to \$34 billion in losses due to piracy worldwide.³¹
- Although the overall global software piracy rate was unchanged from 2004 to 2005, piracy rates decreased in 51 of the 97 countries surveyed, including significant drops in Russia and China. Piracy rates increased in 19 countries over this period.³²
- The countries with the highest software piracy rates in 2005 were Vietnam (90 percent), Zimbabwe (90 percent), Indonesia (87 percent), China (86 percent), and Pakistan (86 percent).³³
- The countries with the lowest software piracy rates in 2005 were the United States (21 percent), New Zealand (23 percent), Austria (26 percent), and Finland (26 percent).³⁴
- Worldwide sales of pirated music in 2004 were worth \$4.6 billion at pirate prices. There were 1.2 billion pirated music CDs in 2004, which was only a 2-percent increase over 2003's amount. However, 34 percent of worldwide CDs sold in 2004 were pirated.³⁵
- The major U.S. motion picture studios lost \$6.1 billion worldwide to piracy in 2005, of which 80 percent was from piracy outside the U.S. Sixty-two percent of the \$6.1 billion loss was from hard goods such as DVDs, with the remaining 38 percent coming from Internet piracy.³⁶

2005 Software Piracy Rates by Region

Region	Software Piracy Rate (%)
North America	22
Western Europe	35
Asia Pacific	54
Middle East/Africa	57
Central/Eastern Europe	69
Latin America	68
European Union	36
Worldwide	35

Source: Business Software Alliance³⁷

Music Industry Statistics for Countries Where Music Piracy is Most Rampant

Country	Legal Market Value (\$millions)	Legal Market Units (millions)	Pirate Market Value (\$millions)	Pirate Market Units (millions)	Piracy Level (%)
Paraguay	2	0.4	18	20	99
China	212	124	411	460	85
Indonesia	85	40	91	159	80
Ukraine	42	15	42	35	68
Russia	491	119	449	243	66
Mexico	360	56	111	76	60
Pakistan	24	40	30	55	59
India	153	130	88	170	56
Brazil	374	66	79	73	52
Spain	573	50	77	16	24

Source: IFPI³⁸

Worldwide Consumer Spending Losses Due to Motion Picture Piracy, 2005 (\$millions)

Country	Loss
China	2,689
France	1,547
Mexico	1,114
U.K.	1,007
Russia	901
Japan	742
Spain	670
Germany	491
Thailand	465
Italy	442

Source: Motion Picture Association, LEK³⁹

Identity Theft and Other Threats

There are many other threats to the Internet and those whose welfare depends heavily on it. Examples include keylogging, phishing, and data security, all of which are related in some way to identity theft, a term that covers a large range of crimes involving stolen credit cards or personal information. As indicated by the tables opposite, estimates of annual losses induced by identity theft in the U.S. vary widely, from \$3 billion to more than \$50 billion.⁴⁰

- A study by Javelin Research found that the average loss per victim of identity fraud increased to \$6,383 in 2006, up 21.6 percent from 2003. The total losses from identity fraud in 2006 were \$56.6 billion, a statistically insignificant 6.4-percent increase from 2003. Sixty-eight percent of the victims incur no costs related to the fraud. Average consumer costs in 2006 were \$422, a decrease of 24 percent from 2003.⁴¹
- According to the Javelin report, there were 8.9 million instances of identity fraud in the U.S. in 2005, an 11.9 percent decrease from 2003. The percentage of U.S. adults who were victims of identity fraud declined from 4.7 percent in 2003 to 4.0 percent in 2006.⁴²
- An April 2006 Bureau of Justice Statistics bulletin found that in 2004, 3.6 million U.S. households (3 percent of total households) discovered that at least one member of the household had been the victim of identity theft within the previous six months.⁴³
- Keystroke logging, the capturing and storage of all of the keystrokes on a computer, can allow criminals to obtain passwords and other vital information. Incidences of keylogging have grown in recent years, from 444 in 2002 to 6,191 in 2005.⁴⁴ Crimes involving stolen passwords induce an estimated \$2.75 billion in losses each year.⁴⁵
- Security threats stemming from the use of instant messaging software increased 1,700 percent in 2005. Ninety percent of these IM threats were from worms, and nine percent were from viruses or Trojans.⁴⁶
- Phishing is the attempt to obtain personal information by posing as an official and recognizable company. Organizations that have been impersonated by phishers include AOL, the IRS, and PayPal. In 2005, phishing accounted for 0.3 percent of all email.⁴⁷ As of May 2006, the country with the most phishing sites was the U.S. with 34.1 percent, followed by China with 15 percent.⁴⁸

Javelin Identity Fraud Survey Results

	2003	2005	2006*
U.S. Adult Victims of Identity Fraud	10.1 million	9.3 million	8.9 million
Fraud Victims as percent of U.S. Population	4.70%	4.25%	4.00%
Total One Year Fraud Amount	\$53.2 billion	\$54.4 billion	\$56.6 billion
Average Fraud Amount per Fraud Victim	\$5,249	\$5,885	\$6,383
Median Fraud Amount per Fraud Victim	\$750	\$750	\$750
Average Consumer Cost	\$555	\$675	\$422
Median Consumer Cost	\$0	\$0	\$0
Average Resolution Time	33 hours	28 hours	40 hours
Median Resolution Time	5 hours	5 hours	5 hours

* Projections

Source: Javelin Strategy and Research⁴⁹

U.S. Department of Justice Identity Theft Survey Results

	2004
Number of households that discovered an identity theft in the past six months	3,589,100
Total estimated loss reported by the victimized households	\$3.2 billion
Mean amount involved for losses of \$1 or more	\$1,290
Median amount involved for losses of \$1 or more	\$400

Source: Bureau of Justice Statistics⁵⁰

Phishing

	Unique Phishing Email Reports	New Phishing Sites
May 2005	14,987	3,326
June 2005	15,050	4,280
July 2005	14,135	4,564
August 2005	13,776	5,259
September 2005	13,562	5,242
October 2005	15,820	4,367
November 2005	16,882	4,630
December 2005	15,244	7,197
January 2006	17,877	9,715
February 2006	17,163	9,103
March 2006	18,480	9,666
April 2006	17,490	11,121
May 2006	20,109	11,976

Source: Anti-Phishing Working Group⁵¹

Chapter 7

The Digital Economy

The rapid development of the digital economy during the last half of the 1990s was made possible by matching investment capital with revolutionary new ideas. The IT (information technology) sector, in particular, benefited from the support of private venture capital firms, which provided about \$5 billion to start-ups in 1995 and almost \$115 billion five years later. By the end of 1999, these investments were concentrated in Internet start-ups stimulated by the spectacular profits reaped from initial public offerings (IPOs) of Internet-related companies.

The IT sector has had a major impact on U.S. economic performance starting in the mid-1990s. From 1995 to 2000, real gross domestic product (GDP) increased at an annual rate of over 4 percent, up from 2.37 percent for the first half of the decade. During the same period, labor productivity, the source of higher wages and better living standards, increased at 2.5 percent annually, nearly double the pace of the previous 25 years.¹

But just as the IT and telecom sectors played a disproportionate role in the economic expansion of the 1990s, they also played a prominent role in the ensuing economic slowdown. The collapse of the IT sector preceded, and to a large extent drove, the more general economic slowdown of 2001. IT investment spending declined, share values fell precipitously, dozens of prominent firms went bankrupt, and hundreds of thousands of jobs were lost. Between 2001 and 2004, however, the rate of GDP growth increased each year, growing at 4.2 percent in 2004. GDP grew at a still respectable 3.5 percent in 2005 and a strong 5.6 percent in the first quarter of 2006,² though the Federal Reserve predicts that economic growth will be between 3.25 percent and 3.5 percent for all of 2006 and between 3 and 3.25 percent for 2007.³

Although the IT sector is not growing as fast as it did in the late 1990s, it has been growing consistently over the past several years, and has played an important role in overall economic growth. In fact, there has been even faster average growth in overall U.S. productivity from 2000 to 2004 (2.8 percent) than from 1995 to 2000 (2.3 percent).⁴ Stock indices for the IT industry and its component sectors exhibit slow but steady growth, indicating that the IT sector has been expanding at a healthy rate.

Funding for New Ideas

Venture capitalists have historically provided the seed money for companies with new ideas. For successful start-ups, IPOs have provided additional capital to finance expansion and growth, as well as large payoffs to early investors. In the last half of the 1990s, the IT sector accounted for an unusually large portion of both venture capital financing and IPOs, though activity in both areas declined dramatically in 2000. Venture capital investment leveled off in 2003 and since then has slowly increased.

- The software and biotechnology industries were the recipients of the most venture capital in 2005, but their shares of the total declined. The telecommunications industry exhibited growth, driven by the wireless subcategory: in 2005, 152 wireless-related companies received \$1.3 billion in venture capital, a 24-percent increase over the \$1.1 billion they received in 2004.⁵
- Worldwide, from January through November 2005, \$138.5 billion was raised by 1268 IPOs, exceeding the \$124 billion raised during all of 2004.⁶
- In the first quarter of 2006, the amount of venture capital invested in the IT sector was consistent with levels of the previous year; in cases where the level of venture capital funding was made public, total investments in the first quarter of 2006 were \$3.01 billion, compared with \$3.19 billion in the first quarter of 2005.⁷
- Public market financings for technology companies based outside the U.S. are rising and making up a growing percentage of total technology financings. Morgan Stanley estimated that the percentage of technology financings accounted for by companies based outside the U.S. in 2005 was 65 percent, compared with 58 percent in 2004, 51 percent in 2003, and 39 percent in 1998.⁸
- In 2005, there were 56 venture-backed IPOs (down from 93 in 2004), which raised a total of \$4.5 billion. The reduction in IPOs can be attributed at least partially to hurdles associated with the Sarbanes-Oxley Act.⁹
- According to the National Venture Capital Association, in 2005, the IT sector had 26 venture-backed companies raising a total of \$2.6 billion. The Internet Specific category was responsible for ten of those, amounting to \$1.3 billion.¹⁰
- Investment in IPES (information processing equipment and software) has been about 25 percent of total private fixed investment since 1998, peaking at 27.8 percent in 2000. Investment in IPES increased to \$488.9 billion in 2005, but did not increase by as much as investment in other sectors, resulting in a somewhat lower 23.4-percent share of total private fixed investment than in the past several years.¹¹

Venture Capital Investments by Industry in the U.S., 2004-2005

Industry	2004		2005	
	Investments (\$millions)	Number of Deals	Investments (\$millions)	Number of Deals
Software	5,246.3	886	4,703.6	840
Biotechnology	4,147.0	340	3,861.6	357
Telecommunications	1,946.8	236	2,129.2	247
Medical Devices and Equipment	1,705.5	249	2,114.1	251
Semiconductors	2,077.8	239	1,778.2	210
Networking and Equipment	1,554.3	183	1,402.1	157
Media and Entertainment	900.2	116	945.1	149
IT Services	612.6	131	921.1	130
Industrial/Energy	646.6	131	740.5	123
Financial Services	435.2	70	643.6	56
Business Products and Services	461.0	80	515.4	89
Computers and Peripherals	592.7	69	467.5	59
Healthcare Services	420.6	68	436.8	67
Electronics/Instrumentation	383.0	65	387.4	83
Consumer Products and Services	297.2	60	362.0	73
Retailing/Distribution	207.4	40	270.5	43
Undisclosed/Other	1.1	3	1.5	5
Total	21,635.3	2,966	21,680.2	2,939

Source: PriceWaterhouseCoopers¹²

U.S. Venture-Backed IPO Industry Breakdown

Industry	Q4 2005		Full-Year 2005	
	Number of Venture- Backed IPOs	Total Venture- Backed Offering Size (\$millions)	Number of Venture- Backed IPOs	Total Venture- Backed Offering (\$millions)
Internet Specific	4	602.1	10	1,259.3
Semiconductors	3	240.5	7	570.1
Communications/Media	2	103.5	4	315.8
Computer Software	1	170.0	3	356.5
Computer Hardware	n/a	n/a	2	55.2
Total Technology	10	1,116.1	26	2,556.9
Medical/Health	4	136.2	13	670.0
Biotechnology	1	55.0	10	506.4
Total Life Sciences	5	191.2	23	1,176.4
Non-high Technology	2	260.8	7	727.6

Source: National Venture Capital Association¹³

Selected Private Fixed Investment Components (\$billions)

	2000	2001	2002	2003	2004	2005
Information Processing and Software (IPES)	467.6	437.0	400.5	431.2	484.2	488.9
Industrial Equipment	159.2	146.7	138.6	139.8	150.7	161.3
Transportation Equipment	160.8	141.7	126.0	126.6	149.6	171.5
Other Equipment	131.2	128.8	127.3	135.5	157.9	172.9
Total Private Fixed Investment	1,679.0	1,646.1	1,568.0	1,667.0	1,884.0	2,086.1
IPES Share of Total (%)	27.8	26.5	25.5	25.9	25.7	23.4

Source: Bureau of Economic Analysis¹⁴

Mergers and Acquisitions

According to the 451 Group, in the first quarter of 2006, technology industry M&A (mergers and acquisitions) spending reached \$120 billion, 67 percent higher than the first quarter of 2005's \$72 billion. More than 800 deals took place, an increase of more than 30 percent over the first quarter of 2005. Telecommunications M&A spending accounted for 78 percent of total M&A spending.¹⁵

- There were 330 venture-backed mergers and acquisitions in 2005, compared with 339 in 2004. In 2005, the average disclosed deal value was \$91.5 million, compared with \$83.4 million in 2004. In 2005, there were 109 transactions in the Software sector and 76 transactions in the Internet Specific sector.¹⁶
- The mergers of AT&T with SBC and Verizon with MCI in late 2005 were important milestones in the restructuring of the telecommunications industry.¹⁷
- The largest deal of the first quarter of 2006 was AT&T's \$67 billion purchase of BellSouth, a continuation of the consolidation in the telecom industry, which has seen \$424 billion in acquisitions since 2002.¹⁸
- Whereas there has been a fluctuation in the number of IPOs per year recently, the M&A market has remained more consistent.¹⁹
- The IT industry was responsible for 72 percent of the disclosed venture-backed M&A deals in the U.S. in 2005, and 68 percent of the total value of those deals.²⁰
- The returns that these acquisitions generate have exhibited consistency during 2004 and 2005. About one-third of them returned at least four times the size of the total investment, with one-third returning between one and four times the investment, and one-third returning less than the total investment.²¹

Venture-Backed Liquidity Events by Year

Year	Total M&A Deals	M&A Deals with Disclosed Values	Total M&A Disclosed Value (\$millions)	Average Deal Size (\$millions)	Number of IPOs	Total IPO Offer Amount (\$millions)	Average IPO Offer Amount (\$millions)
2000	317	203	68,500	338.4	264	25,500	96.6
2001	353	165	16,800	101.8	41	3,500	85.1
2002	316	151	7,900	52.1	24	2,500	103.1
2003	293	123	7,700	62.8	29	2,000	69.7
2004	339	185	15,400	83.4	93	11,000	118.4
2005	330	157	14,400	91.5	56	4,500	79.7

Source: National Venture Capital Association²²

Venture-Backed M&A Industry Breakdown, 2005

Industry	Number of Venture-Backed M&A Deals in the U.S.	Number of Venture-Backed M&A (Disclosed) Deals in the U.S.	Total Venture-Backed Disclosed Deal Value (\$millions)
Internet Specific	76	36	3,408.1
Semiconductors	14	6	281.2
Communications/Media	31	15	2,316.8
Computer Software	109	50	3,462.7
Computer Hardware	13	6	233.9
Total Technology	243	113	9,702.6
Medical/Health	46	25	3,277.0
Biotechnology	12	4	699.5
Total Life Sciences	58	29	3,976.5
Non-High Technology	29	15	685.2
Total	330	157	14,364.4

Source: National Venture Capital Association²³

IT-Sector Revenue Trends and Stock Indices

According to the International Data Corporation, the worldwide market for IT products and services was \$2.1 trillion in 2005, with hardware responsible for \$800 billion, and software for \$200 billion.²⁴ As a whole, the information technology sector grew at a stable and consistent rate in 2005 and the first half of 2006. Revenues continued to increase, and stocks generally grew over the period, although there was a decline in some IT indices in the second quarter of 2006.

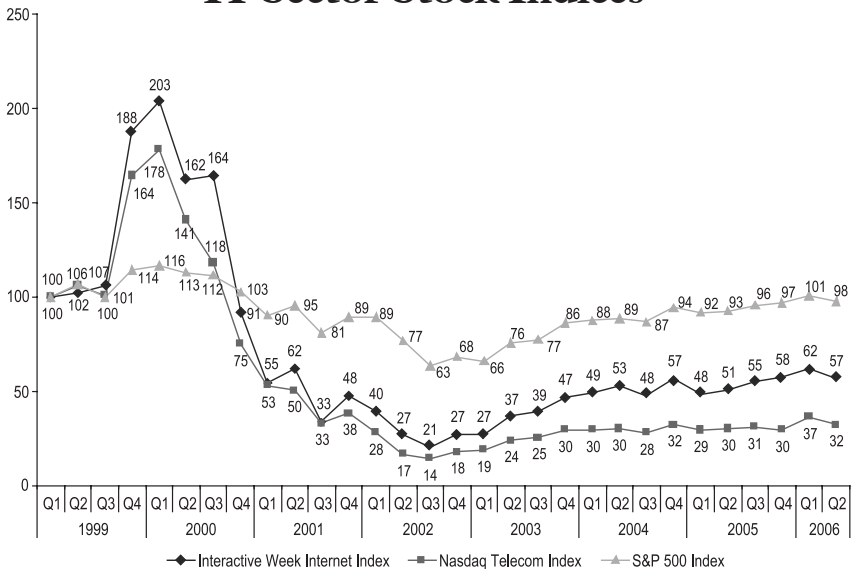
- In 2005, the top ten Internet companies ranked by Morgan Stanley (Google, eBay, Yahoo!, Yahoo! Japan, Amazon, T-Online, InterActive, AOL, MSN, and Rakuten) had a combined \$28 billion in revenue. Of that amount, 61 percent was from commerce, 36 percent was from advertising, and 3 percent was from payments.²⁵
- From the first quarter of 1999 to the second quarter of 2006, the Interactive Week Internet index declined by 43 percent, and the Nasdaq Telecom index declined by 68 percent, while the S&P 500 index remained roughly constant.²⁶
- At the peak of the bubble in the first quarter of 2000, the Internet index was 203 (from where it would decline 90 percent over the next two and a half years), the telecom index was 178 (from where it would decline 92 percent over the next two and a half years), and the S&P 500 index was 116 (from where it would decline 46 percent over the next two and a half years).²⁷
- From mid-2002 to mid-2006, however, the Internet and telecom indices have risen much faster than the S&P 500 index, with the Internet index increasing 171 percent, the telecom index increasing 129 percent, and the S&P 500 index rising 56 percent.²⁸
- North American companies are collectively responsible for \$2.5 trillion of the estimated worldwide total tech company market capitalization of \$3.9 trillion, a 63-percent share. Japanese companies make up 17 percent of this amount, Asian companies (excluding Japan) make up 11 percent, and Europeans only 9 percent. The changes in these percentages from previous years are all rather small, apart from Asian companies, which grew 39 percent year-over-year.²⁹

Select Worldwide IT-Related Companies' Capitalization and Revenues, 2005

United States	Market Capitalization (\$millions)	Revenue (\$millions)	Europe	Market Capitalization (\$millions)	Revenue (\$millions)
Microsoft	281,510	39,788	T-Online Intl. AG	11,517	2,730
Google	97,820	6,139	Thomson Multimedia	4,643	6,727
AOL Time Warner	78,544	43,652	TPI	3,991	768
eBay	53,190	4,552	Eniro	1,983	607
Yahoo!	43,119	3,696	Seat Pagine Gialle	1,968	809
Electronic Arts	15,656	2,862	Freenet.De AG	1,577	845
Amazon.com	15,055	8,490			
E*Trade	10,210	2,548	Japan		
InterActiveCorp	9,944	5,754	Yahoo! Japan	38,029	1,099
Intuit	9,157	2,038	Softbank Corp.	27,785	7,809
Monster.com	5,901	987	Nintendo	18,443	4,808
VeriSign	5,643	1,609	Rakuten	9,903	1,099
NAVTEQ	4,458	497	Konami	3,292	2,432
WebMD	3,652	169	Cyber Comm.	1,935	225
			South Korea		
			NHN Corp.	4,052	253
			Ncsoft Corp.	1,265	280

Source: Morgan Stanley³⁰

IT-Sector Stock Indices



Source: Yahoo Finance³¹

All indices are scaled so that they equal 100 in Q1 1999.

IT Business Spending

IT spending has been an important source of gains in U.S. productivity over the past several years. In the U.S., \$416 billion was spent on information technology in 2005, an increase of 7 percent over 2004.³²

- A Gartner survey found that worldwide IT budgets are expected to increase by an average of 2.7 percent in 2006, compared to an increase of 2.5 percent in 2005.³³
- IDC FutureScan predicted 5-percent growth in U.S. IT spending in 2006.³⁴
- Capital expenditures of many of the largest Internet companies grew dramatically from 2003 to 2005. Google spent \$177 million on capital in 2003 but is estimated to have spent \$700 million for 2005. Yahoo! spent \$117 million in 2003, compared with \$405 million in 2005, and Amazon spent \$46 million in 2003 compared with \$172 million in 2005. eBay, however, had comparatively little growth in spending, with \$365 million in capital expenditures in 2003 and \$396 million in 2005.³⁵
- Investment in IT equipment, software, services, and staff grew 6.6 percent in 2005, from \$708 billion in 2004 to \$755 billion for the year. Forrester Research predicts that 2006 will see growth of 6.8 percent in 2006, followed by a slower period in 2007 (2.3-percent growth) and 2008 (4.8-percent growth). In 2009, however, there is expected to be an upswing, with growth of 8.0 percent for that year and 9.5 percent in 2010.³⁶
- IDC expects U.S. IT spending to reach about \$500 billion by 2009, and worldwide IT spending to grow to about \$1.3 trillion by that time, with a total worldwide IT spending annual growth rate from 2005 to 2009 of 4.5 percent.³⁷
- The 50 largest IT services vendors worldwide had a combined revenue of \$262 billion in 2005, an increase of 1.9 percent over 2004's amount. This represents a 51-percent share of the IT services market, which was valued at \$513 billion in 2005. Compared with the 8-percent growth in the overall market for external IT services in 2005, this indicates that the larger firms are growing more slowly than smaller vendors.³⁸
- Morgan Stanley predicts that global IT services revenue will grow 8 percent in 2006, with that growth due to three factors: improvements in the U.S. consulting and discretionary IT services spending environment, healthy European growth expectations, and strong unit volume growth from Indian IT providers.³⁹

Worldwide IT Spending Change by Industry for Organizations with More than \$1 Billion in Revenue

Industry	Spending Change (%)	Spending Change (%)
	2004-2005	2005-2006*
Consumer Products	0.0	7.9
Electronics	8.3	7.8
Insurance	7.7	6.5
Chemicals	-0.2	5.1
Construction and Engineering	0.0	4.9
Information Technology	2.3	4.7
Healthcare	8.9	4.6
Education	6.0	4.1
Energy	-2.9	3.9
Pharmaceuticals	5.6	3.3
Utilities	-0.6	3.1
Banking and Financial Services	7.1	3.1
Media	2.8	2.9
Government	5.0	2.4
Food/Beverage Processing	6.0	1.3
Manufacturing	-1.3	1.2
Telecommunications	0.2	0.0
Metals/Natural Resources	0.8	0.0
Hospitality and Travel	0.0	0.0
Transportation	-1.4	-0.2
Professional Services	10.1	-1.7
Retail	-0.1	-4.9

* Projections

Source: Gartner⁴⁰

Worldwide IT Spending Growth by Industry, 2005-2009

Industry	Compound Annual Growth Rate (%)
Communications and Media	5.6
Healthcare	5.5
Government	5.0
Utilities	5.0
Resource Industries	4.9
Banking	4.8
Financial Markets	4.8
Process Manufacturing	4.3
Retail	4.3
Transportation & Trans. Services	4.3
Construction	4.2
Discrete Manufacturing	4.0
Wholesale	4.0
Consumer/Home	3.9
Services	3.9
Education	3.7
Insurance	3.4
Total Worldwide IT Spending Growth	4.5

Source: Tekrati, IDC⁴¹

Productivity

From 1974 to 1995, U.S. productivity growth was approximately 1.4 percent per year, and from 1995 to 2000, it was about 2.5 percent per year. Since 2000, U.S. productivity has grown over 3 percent per year. Much of the increase in U.S. productivity over the past decade can be attributed to the U.S. economy's investment in information technology.⁴²

- American companies tend to take advantage of new technologies to a greater extent than other nations; for example, American companies in Britain use 40 percent more IT capital per worker than the average company in Britain does.⁴³
- In 2005, U.S. productivity rose by 2.7 percent, a decrease from 2004's growth rate of 3.4 percent.⁴⁴
- From 1997 to 2004, the labor productivity indices for many IT-related industries have exhibited significant growth. The index for the computer manufacturing industry grew 143 percent, the software publishing industry's index grew 62 percent, the retail trade industry's index grew 41 percent, the wired telecommunications carriers' index grew 31 percent, and the wireless telecommunications (except satellite) carriers' index grew 189 percent.⁴⁵
- From 2001 to 2005, the most significant contributors to growth in production and capacity have been those identified by the Federal Reserve as high-tech industries (semiconductors and related electronic components, computers and peripheral equipment, and communications equipment). Whereas the total production index grew 1.0 percent and the total capacity index grew 1.1 percent over this period, these high-tech industries' production index grew 12.0 percent and their capacity index grew 14.3 percent.⁴⁶
- From 2001 to 2004, U.S. GDP grew at a faster rate each year. Although the 2005 growth rate of 3.5 percent was lower than 2004's 4.2 percent, the 5.6-percent annualized growth rate in the first quarter of 2006 was very strong.⁴⁷ However, the Federal Reserve predicts that GDP will grow between 3.25 percent and 3.5 percent for all of 2006 and between 3 and 3.25 percent for 2007.⁴⁸
- The contribution of information processing equipment and software (IPES) to GDP growth over the past decade and a half performed in a manner similar to that of the overall digital economy: it grew steadily throughout the 1990s, collapsed in the first year of the 21st century, and since then has rebounded slowly but consistently.⁴⁹

Rates of Change in U.S. Industrial Production and Capacity

	2005 Proportion (%)	2001-2005 Average	Annual Percent Change				
			2001	2002	2003	2004	2005
Production							
Total Index	100.0	1.0	-5.3	2.3	1.5	4.3	2.3
Manufacturing	80.8	1.2	-5.6	2.2	1.7	5.1	2.6
Excluding Selected High-Tech Industries*	76.0	0.5	-5.2	1.9	0.4	4.2	1.2
Selected High-Tech Industries*	4.8	12.0	-9.8	4.8	21.1	18.4	25.2
Mining and Utilities	19.2	0.2	-3.4	2.7	0.6	0.5	0.9
Capacity							
Total Index	100.0	1.1	2.9	0.7	-0.2	0.6	1.5
Manufacturing	82.9	1.1	2.8	0.4	-0.1	0.5	2.0
Excluding Selected High-Tech Industries*	77.4	0.2	0.8	-0.2	-0.5	0.1	0.6
Selected High-Tech Industries*	5.5	14.3	27.8	9.5	8.0	6.8	19.7
Mining and Utilities	17.1	1.5	3.1	2.3	1.3	1.2	-0.2

* The selected high-tech industries are semiconductors and related electronic components, computers and peripheral equipment, and communications equipment.

Source: Federal Reserve Board⁵⁰

U.S. Industrial Production, Select Industry Groups (percent change)

Industry	2001	2002	2003	2004	2005
Home Electronics	6.3	-7.7	18.5	-3.7	16.4
Appliances, Furniture, Carpeting	-2.9	4.0	2.2	2.4	2.4
Information Processing	-15.5	-8.9	6.5	14.6	19.4
Computer and Electronic Products	-8.9	2.9	15.7	16.1	23.3
Electrical Equipment, Appliances, and Components	-14.8	-2.2	-0.7	5.2	6.8
Selected High-Technology Industries*	-9.8	4.8	21.1	18.4	26.1
Computers and Peripheral Equipment	-2.7	-2.6	5.8	4.6	11.3
Communications Equipment	-27.4	-22.6	9.9	22.3	25.7
Semiconductors and Related Electronic Components	-0.6	26.0	34.1	21.4	30.7

* The selected high-tech industries are semiconductors and related electronic components, computers and peripheral equipment, and communications equipment.

Source: Federal Reserve Board⁵¹

Contribution of Core Components to GDP Growth (percent change at annual rate)

	2001	2002	2003	2004	2005	2005	2005	2005	2005	2006
						Q1	Q2	Q3	Q4	Q1
Gross domestic product growth	0.80	1.90	2.70	4.20	3.50	3.80	3.30	4.10	1.70	5.60
Gross private domestic investment	-1.39	-0.37	0.58	1.82	1.00	1.42	-0.63	0.87	2.54	1.44
Information processing equipment and software (IPES)	-0.08	-0.18	0.19	0.49	0.48	0.72	0.53	0.42	0.32	0.74
Personal consumption expenditures	1.74	2.14	2.05	2.71	2.48	2.44	2.35	2.85	0.62	3.53

Source: Bureau of Economic Analysis⁵²

Employment and Outsourcing in the IT Sector

Jobs in information technology and related fields made up about 3.5 percent of the U.S. workforce in 2005, roughly the same share they had prior to the boom and bust periods; in 1997 this share was 3.7 percent.⁵³ Although the IT sector has exhibited increases in output and productivity over the past ten years, total U.S. employment in the IT sector has not grown in a corresponding manner. Instead, jobs have tended to flow outside of the U.S. where wages are lower.

- Total global offshore spending on IT services is expected to reach \$50 billion in 2007.⁵⁴
- Gartner predicts that the outsourcing market will grow 7.3 percent per year from 2004 to 2009. Information technology outsourcing is expected to grow 5.1 percent in 2006, and business process outsourcing to grow at 8.7 percent.⁵⁵
- Outsourcing megadeals (deals worth more than \$1 billion) represented 52 percent of publicly reported outsourcing contract value between 2003 and 2005. But their share of all outsourcing is declining—outsourcing is becoming increasingly appealing for small and medium-sized companies. In spite of the overall growth in outsourcing, in 2006 there were only 11 outsourcing megadeals, compared with 12 in 2004 and 16 in 2003.⁵⁶
- The average length of an IT outsourcing contract declined from 6.2 years in 2003 to 5.3 years in 2005. The average length of a business process outsourcing contract declined from 5.5 years in 2003 to 4.8 years in 2005.⁵⁷
- A September 2005 poll of 1,400 CIOs (chief information officers) found that 16 percent expected to hire full-time IT staff in the future, while 4 percent planned staff reductions. Together the net 12-percent increase in hiring is the biggest increase since the third quarter of 2002.⁵⁸

Average Regional Tech Salaries in Dollars

Metro Area	2003	2004	2005*
Silicon Valley, CA	87,700	84,200	85,958
New York, NY	78,600	76,500	80,286
Washington, DC	71,400	74,000	77,403
Los Angeles, CA	70,800	71,200	77,116
Denver, CO	73,000	69,700	77,073
Boston, MA	76,300	75,300	80,112
Atlanta, GA	73,600	75,500	73,213
Chicago, IL	71,100	69,200	73,023
Philadelphia, PA	69,500	69,500	69,750
San Diego, CA	69,000	71,600	77,129
Seattle, WA	71,000	69,600	66,940
Dallas/ Ft. Worth, TX	73,000	71,900	71,040
Detroit, MI	62,300	61,900	64,127
U.S.	69,400	66,300	69,700

* Projections

Source: Business Week Online⁵⁹

Annual Change in IT-Industry Employment, Select Regions

Region*	1999-2001	2001-2003	2003-2004	2004-2005
Boston, MA	7,100 (13.5%)	-16,300 (-27.3%)	-1,200 (-2.8%)	2,000 (4.7%)
Chicago, IL	4,200 (7.9%)	-10,200 (-17.7%)	0 (0%)	2,000 (4.2%)
Dallas, TX	2,800 (5.5%)	-11,200 (-21.0%)	1,200 (2.9%)	1,400 (3.2%)
Los Angeles, CA	7,400 (16.9%)	-7,600 (-14.8%)	-1,700 (-3.9%)	-400 (-1.0%)
San Francisco, CA	13,100 (39.5%)	-18,000 (-38.9%)	500 (1.8%)	2,500 (8.7%)
San Jose, CA	21,900 (34.9%)	-20,600 (-24.3%)	0 (0%)	3,500 (5.5%)
Seattle, WA	11,700 (25.5%)	-6,200 (-10.8%)	2,500 (4.9%)	3,400 (6.3%)
Washington, DC	11,400 (13.7%)	6,300 (6.7%)	9,000 (8.9%)	4,800 (4.4%)
U.S.	253,100 (14.0%)	-302,400 (14.7%)	10,300 (0.6%)	36,600 (2.1%)

* These estimates do not include some sectors of the IT industry due to the absence of adequate data. Difficulty in determining city boundaries, though addressed in the methodology used to obtain the data, make it difficult to obtain precise estimates for each geographical area.

Source: Srivastava and Theodore⁶⁰

The Future of the Digital Economy

The outlook at the beginning of 2006 was generally positive, with a survey of worldwide business executives demonstrating an increase in confidence about their respective industries and national economies—the first time executive confidence in the global economy had risen for two years.⁶¹

- Morgan Stanley identified several high-tech innovations that could have new product cycles with significant economic impacts. Among them were:
 - Blade servers and storage aggregation
 - Microsoft's Vista
 - 3G cell phones reaching mainstream price points
 - VoIP merging with cellular technology
 - New video game platforms
 - Digital TV and high definition video applications
 - Fiber to the home/node/premise
 - NAND flash enabled portable applications⁶²
- Gartner identified several IT industry trends it believes will have important effects. Among them were:
 - By 2010, 30 percent of U.S. homes will use only cellular or Internet telephony.
 - The job market for IT specialists will shrink 40 percent by 2010, and the market for IT “versatilists” skilled in several fields will increase.
 - Through 2008, investigation of new technologies will slow as discretionary budgets are diverted to regulatory compliance.⁶³
 - By 2010, 70 percent of the developed world will spend ten times as much time interacting with people electronically as physically.⁶⁴
- A 2005 Pew survey of technology experts and scholars found that:
 - Sixty-six percent of the experts surveyed believe that at least one devastating attack will occur in the next ten years on the networked information infrastructure or the country's power grid.
 - The experts seemed to think that the Internet will bring the most dramatic change to the news and publishing industries and the least amount of change to religion.
 - Fifty-nine percent of the experts believed that there will be more government and business surveillance as technologies advance and proliferate.
 - Fifty-six percent believed that the prevalence of home-schooling and telecommuting will diminish the boundaries between work and leisure and affect family dynamics.
 - Fifty percent believed that anonymous and free music file-sharing on peer-to-peer networks will still be easy to perform in ten years.⁶⁵

Positive Global Confidence Index, from a January 2006 Global Survey of Business Executives (percent giving positive responses)

<u>Indicators</u>	<u>2005</u>	<u>2006</u>
Current economic conditions in your country vs. 6 months ago	51	56
Expectations for your country's economy 6 months ahead	52	56
Current economic conditions in your industry vs. 6 months ago	55	57
Expectations for your industry 6 months ahead	57	58

Source: Media Post⁶⁶

Hiring Expectations of Executives in Select Regions over the Next Six Months, January 2006 (percent answering "yes")

<u>Region</u>	<u>Increase</u>	<u>If increase, increase by more than 25%</u>	<u>Decrease</u>	<u>If decrease, decrease by more than 10%</u>
India	65	11	9	19
China	62	15	8	50
Developing Markets	40	5	14	40
North America	39	7	16	9
Asia-Pacific	38	6	18	15
Europe	34	8	21	11

Source: Media Post⁶⁷

Appendix: Internet Timeline, July 2005-June 2006

2005

July 6: European Parliament rejects software patent directive. The European Parliament votes 648 to 14 with 18 abstentions against the Computer-Implemented Inventions (CII) patents directive, which would have given software patent owners unified protections throughout the European Union and made European patent laws similar to those in the U.S.

July 27: Telecom Reform Act proposed. Senator John Ensign (R-Nev.) and Senator John McCain (R-Ariz.) introduce the Broadband Investment and Consumer Choice Act, which aims to reform regulation of the U.S. telecommunications market by leveling the playing field between telephone, cable, and satellite companies offering broadband services. The bill would eliminate state and local franchise requirements for all video providers and telephone companies that enter the industry.

August 3: FCC approves Sprint-Nextel merger. Sprint, the third largest provider of U.S. commercial mobile telephone service, receives permission to acquire Nextel, the fifth largest wireless provider. Sprint Nextel remains the third largest mobile phone company in the U.S.

August 5: FCC simplifies advanced wireless rules. Advanced wireless service rules are modified by the FCC to provide greater flexibility and access to spectrum for small and rural providers in an effort to boost Third Generation (“3G”) mobile networks.

August 5: FCC mandates some VoIP wiretaps. After a petition from the Department of Justice, the Federal Bureau of Investigation, and the Drug Enforcement Agency, the FCC rules that providers of certain broadband and interconnected Voice over Internet Protocol services must accommodate law enforcement wiretaps when necessary.

August 5: FCC eliminates facilities sharing requirements for wireline broadband. A FCC Report and Order puts wireline broadband Internet access on equal footing with cable modem service by specifying that the former is an “information service.” As a result, facilities-based providers are no longer required to offer wireline broadband transmission separately from their Internet service as a stand-alone service on a common-carrier basis. This is expected to allow wireline broadband Internet access providers to respond quickly to consumer demand and spur more vigorous head-to-head competition with broadband services provided over other platforms.

August 21: DReaM: Royalty-free, open source DRM. Sun Microsystems launches an open source version of its digital rights management software, which can then be easily used by any electronic device. Announced at a PFF summit in Aspen, Colorado, the Open Media Commons initiative is met with surprise, and

some were uncertain whether the idea would be profitable or the software widely adopted.

August 22: Warner Music Group announces e-label. Also at the PFF Aspen Summit, Warner announces it will create a marketing strategy by which some emerging artists release bundles of three songs online about every three months rather than an album of ten or more songs once every few years.

September 5: Australian Federal Court finds Kazaa guilty. The court finds that the peer-to-peer file-sharing network allowed users to infringe on music copyrights. Kazaa is allowed to remain in operation but is required to implement filters on its software.

September 12: eBay acquires Skype. Online auction giant eBay expands its services with a \$2.6 billion cash and stock deal to acquire VoIP company Skype Technologies. The acquisition is expected to strengthen eBay's global marketplace and payments platform.

October 5: Manassas, Virginia becomes the first municipality to offer broadband over power line (BPL). A public-private partnership grants web access to all residents, about 12,500 households, through BPL technology. Manassas utility workers have installed COMTek equipment, which provides web-hosting services, on the city's power grid.

October 13: The U.S. Justice Department fines Samsung \$300 million. In the second largest fine ever imposed in an antitrust case, the South Korean chipmaker pleads guilty to charges of conspiring to fix prices with other companies between April 1999 and June 2002, harming computer manufacturers such as Dell, Hewlett-Packard, Apple Computer, IBM, and Gateway.

October 19: The Association of American Publishers sues Google over Google Print project. The principal trade association of the book industry files a lawsuit in the federal district court in New York to stop Google from pursuing its Google Print project, which would make books from Stanford University, Harvard University, and the University of Michigan searchable on the Internet. Oxford University and the New York Public Library are also participating in the project, but would only make works in the public domain available. The association represents many large publishers including McGraw-Hill Companies, Pearson Education, Penguin Group USA, Simon & Schuster, and John Wiley & Sons.

October 31: FCC approves SBC-AT&T and Verizon-MCI mergers. The Commission, with a 4-to-0 vote, approved SBC's merger with AT&T and Verizon's purchase of MCI. The companies are required to freeze wholesale prices charged to competitors and guarantee that Internet access will be a stand-alone service which won't require users to buy local phone service as well. The SBC/AT&T merged entity, which will take the AT&T name, will reunite Ma Bell companies separated pursuant to the historic divestiture in 1984.

November 2: Sprint Nextel joins forces with the top four cable companies. Comcast, Cox Communications, Time Warner Cable, and Advance/Newhouse Communications form a joint venture with Sprint Nextel that will allow for the bundling of wireless phone services with high-speed data, voice, and video services—referred as the “quadruple play.” The companies also plan to work together on new technologies, such as allowing people to use their cell phones to trigger video recorders.

November 7: “NBC Nightly News” airs evening newscast online. Available on demand and free of charge, NBC is the first broadcast network to offer its evening news on the Internet.

November 7: File-swapping company Grokster agrees to pay \$50 million. After a four-year legal battle, Grokster agrees to stop supporting its file-swapping network, which allows users to exchange copyrighted movies and music. The \$50 million will go to movie studios, record labels, and music publishers.

November 14: AOL and Warner Brothers to make old TV shows available online. The two companies launch a joint venture called “In2TV Broadband Network” that allows AOL users to download DVD-quality episodes of classic TV shows for free, interrupted by only a few minutes of advertisements. Several episodes of 30 out-of-circulation series from the 1970s, 1980s, and 1990s will be available, including “Sisters,” “Wonder Woman,” “Kung Fu,” and “Growing Pains.”

November 15: Federal appeals court rules on VoIP 911 access. FCC regulations on 911 emergency access for subscribers to Internet telephone services are upheld. VoIP providers must provide 911 emergency service to all areas in which they offer services.

November 18: Internet governance resolved. At a World Summit on the Information Society in Tunisia, leaders from around the world agree to continue allowing ICANN, a U.S.-based nonprofit group, to oversee Internet governance.

December 16: U.S. Senator Jim DeMint introduces telecom reform bill. Senator DeMint (R-S.C.) introduces the Digital Age Communications Act. The bill would create a market-oriented regulatory system that treats all communications systems including Internet, landline, cable, and wireless the same.

December 20: Google invests in AOL Time Warner. Google and AOL Time Warner announce Google’s \$1 billion investment in AOL for a 5-percent stake in the company. The agreement includes sections regarding advertising and the linking-up of Google and AOL’s instant messaging networks.

December 22: The European Commission threatens to fine Microsoft \$2.4 million per day. The European Commission claims that Microsoft failed to comply with a landmark antitrust ruling in March 2004 by neglecting to provide the necessary protocol documentation about its server programs. The Commission threatens Microsoft with a fine of 2 million euros per day.

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January 6: Google launches paid video download service. Google enters the content distribution business with the Google Video Store, which combines video search with Google-made digital rights management (DRM) and the long-rumored Google Payments system.

January 9: Clear Channel showcases on-demand video content. Clear Channel Radio's online music and radio service is adding a video offering to its local stations' websites. A test of the free feature, "Videos on Demand," will appear on 16 station sites.

January 26: ChoicePoint agrees to pay \$15 million for failing to protect customer information. Consumer data broker ChoicePoint agrees to pay \$10 million in civil penalties and \$5 million in consumer redress to settle charges by the FTC that it violated the Fair Credit Act (FCRA) by supplying consumer credit reports to subscribers who did not have permissible purpose to attain them. The company had compromised 163,000 consumers' personal financial records.

February 6: AOL begins charging for "certified" email. Although still retaining its free e-mail services, AOL plans to add an option to purchase a "digital stamp" (for less than one cent) that will assure e-mail delivery to the intended recipient and decrease spam and identity fraud scams.

February 8: President Bush signs digital television transition bill. The bill sets February 17, 2009 as the date U.S. broadcasters must move to all-digital broadcasts and end transmission of analog signals. The transition will make 60 MHz available for auction to mobile wireless carriers and 24 MHz for emergency response agencies.

February 9: FCC report favors 'a la carte' TV. Contrary to a previous FCC study, an FCC report finds that consumers would benefit under an a la carte system of video subscription.

February 15: Congress holds hearings on Internet companies' compliance with Chinese mandates. Google, Yahoo!, Cisco, and Microsoft defend their reasons for satisfying China's demands to censor information and hand over user data. Google, Microsoft, and Yahoo! had recently been criticized for censoring information and releasing user data to the Chinese government, while Cisco was accused of providing hardware that allowed government censors to filter Internet content.

February 28: AOL files lawsuits against phishers. America Online files three civil lawsuits in Virginia seeking \$18 million in damages against several major phishing gangs.

March 1: VeriSign holds control of the .com registry under a settlement of a lawsuit with ICANN. The Internet Corporation for Assigned Names and Numbers (ICANN) endorses a settlement that includes the renewal of VeriSign administration of the .com registry.

March 3: A \$612.5 million settlement ends BlackBerry case. The settlement allows Canadian firm Research In Motion (RIM) to continue selling the popular BlackBerry devices. American patent-holding business NTP claimed that RIM stole its technology but will not pursue any further patent claims against RIM or its partners.

March 3: Department of Justice launches probe into online music sales. The U.S. Department of Justice is looking into the four largest record labels and possibly uncompetitive practices of music download pricing.

March 5: AT&T and BellSouth to merge. AT&T Inc. and BellSouth Corporation announce plans to merge in a deal valued at \$67 billion. The merger will streamline the ownership and operations of Cingular Wireless, jointly owned by AT&T and BellSouth, into a single fully integrated wireless and wireline Internet Protocol network offering a full range of advanced solutions.

March 6: AOL opens AIM to third parties. America Online has opened its instant messaging software to developers and integrators, allowing them to build IM capabilities into their applications or services. Called the Open AIM initiative, AOL is inviting others to work on building plug-ins for software based on AIM.

March 14: Google is required to surrender some of its data. A federal judge rules that Google must hand over indexed page data to the government but does not have to provide user search queries. The Justice Department had been seeking information from Google in an effort to shield children from online pornography.

March 15: FCC fines broadcasters for indecent programming. The Commission addresses hundreds of thousands of complaints alleging that various broadcast television programs aired between February 2002 and March 2005 were indecent, profane, and/or obscene. The fines are the largest in the Commission's history, nearly \$4 million in total, including \$3.6 million against CBS for an episode of "Without a Trace." ABC, CBS, NBC, Fox, and the Hearst-Argyle Television Inc. group of stations filed appeals in various federal courts complaining that the indecency rules are "vague and inconsistently applied."

March 24: FTC slaps spammer with \$900,000 fine. The Federal Trade Commission fines a spammer a record-setting \$900,000 for violating the CAN-SPAM Act. According to the complaint, Jumpstart Technologies of San Francisco, California has spammed consumers since 2002, sending millions of messages disguised as personal e-mails in an attempt to hype its FreeFlixTix website.

April 6: Google and EarthLink to provide Wi-Fi to San Francisco. The city of San Francisco, California selects a joint bid from Google and EarthLink to make free and paid wireless service available throughout the city. This will be the fourth municipal Wi-Fi deal for EarthLink.

April 12: PayPal is required to surrender financial information to the IRS. A federal court in California gives the IRS permission to require PayPal, which enables

users to send and receive money online, to give the IRS information about people who might be evading taxation.

April 12: FCC sets date for spectrum auction. The FCC announces its first auction of spectrum licenses for Advanced Wireless Services (AWS-1), which is scheduled to begin June 29, 2006 and include 1,122 AWS-1 licenses in the 1710-1755 MHz and 2110-2155 MHz bands. Information on bidders' identities will not be made public until after the auction.

May 9: Congress introduces new legislation limiting access to online social networking. The Deleting Online Predators Act (DOPA) attempts to make sites such as MySpace, Friendster, and Facebook inaccessible to minors using school or library computers.

May 11: Philadelphia's citywide Wi-Fi project approved. The Philadelphia city council unanimously approves a 10-year contract with EarthLink, the final step in the city's ambitious plan to provide city-wide broadband Internet access.

May 15: The Supreme Court rejects injunction against eBay's "buy it now" feature in the *eBay vs. MercExchange* case. About six weeks after hearing oral arguments, the justices ruled that the decision "rests within the equitable discretion of the district courts, and that such discretion must be exercised consistent with traditional principles of equity, in patent disputes no less than in other cases governed by such standards." The lawsuit will return to a U.S. District Court to determine whether eBay is liable for patent infringement.

May 17: RIAA sues XM. The Recording Industry Artists Association files suit against XM Satellite Radio because of XM's Inno device, which allows subscribers to record up to 50 hours of XM content for playback. RIAA has demanded the removal of Inno from the market for violating current broadcasting licensing arrangements. XM insists the device is legal, citing laws including the Audio Home Recording Act.

May 19: FCC postpones spectrum auction. The auction that had been scheduled to start on June 29, 2006 is moved to August 9, 2006 in order to provide participants with more time for preparation and planning, following the revision of designated entity rules.

May 22: Department of Veterans Affairs suffers security breach. A laptop containing 26.5 million U.S. military veterans' and spouses' personal data is stolen from a VA employee. Subsequently, the laptop is recovered, apparently with no information compromised.

May 25: Dell chooses Google over Microsoft. New Dell computers will now be shipped with the Google desktop, toolbar, and home page pre-installed. The partnership, seen as a blow to Microsoft, highlights the fierce Internet competition for the PC desktop.

May 29: U.S. Patent and Trademark Office rejects JPEG patents. In the legal battle over image compression standards, the U.S. Patent and Trademark Office

rejects 19 of 46 claims by Forgent Networks in a patent dispute in which Forgent asserted licensing rights over JPEG digital images.

June 2: FCC auctions air-to-ground spectrum. An auction of spectrum, currently licensed to Verizon for its Airfone service, concludes after about three weeks. The winning bidders for the two licenses are AC BidCo, which paid \$31.3 million for 3 MHz, and LiveTV, which paid \$7 million for 1 MHz.

June 9: U.S. House of Representatives passes telecom bill. The Communications Opportunity, Promotion, and Enhancement Act of 2006, sponsored by Commerce Committee Chairman Joe Barton (R-Texas), passes by a vote of 321 to 101. The bill would enable telephone companies to obtain national video franchising and thereby more easily compete with cable companies. A highly controversial “Net Neutrality” amendment to the bill was not included in the final draft after failing by a vote of 152 to 269, although the bill included some net neutrality provisions.

June 15: Bill Gates to retire in 2008. Following the announcement that Bill Gates will give up the post of Chief Software Architect of Microsoft, Ray Ozzie is named as his successor. During the two-year transition period, Gates will begin to scale back his day-to-day role and co-CTO Craig Mundie will also move to an elevated role of “Chief Research and Strategy Officer.” Gates will stay on as Chairman and Steve Ballmer will remain Microsoft’s CEO.

June 22: House approves global rules for U.S. tech companies. The U.S. House of Representatives passes a bill, by a unanimous voice vote, imposing strict new obligations on American Internet firms engaging in business with “Internet-restricting countries” such as China.

June 26: Supreme Court to hear *KSR vs. Teleflex*. The Supreme Court decides to hear a case involving the “obviousness” of patents.

June 28: U.S. Senate Committee approves telecom reform bill. The bill, which would allow national video franchising, passes the Senate Commerce Committee with a 15-to-7 vote, with a “Net Neutrality” amendment failing by an 11-to-11 vote. The bill requires municipalities to negotiate with video provider franchises within 90 days, speeding up the process of deployment.

June 30: France passes law on compatibility of equipment. After considering a law that would have required Apple to make iTunes Music Store compatible with other MP3 devices, the French parliament passes a less restrictive bill that may allow Apple to keep its popular iTunes format unchanged. The new law allows the interoperability requirement to be waived with the permission of the rights holders to the music.

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List of Abbreviations

ADSL:	Asymmetric Digital Subscriber Line
AIM:	AOL Instant Messenger
ARPANET:	The computer network created by the Advanced Research Projects Agency
ATM:	Automatic Teller Machine
BPL:	Broadband Over Power Lines
ccTLD:	Country-Code Top Level Domain
CAGR:	Compound Annual Growth Rate
CLEC:	Competitive Local Exchange Carrier
DRM:	Digital Rights Management
DSL:	Digital Subscriber Line
DVD:	Digital Versatile Disc or Digital Video Disc
DVR:	Digital Video Recorder
EMEA:	Europe, the Middle East, and Africa
ENIAC:	Electronic Numerical Integrator and Computer
EVDO:	Evolution Data Only or Evolution Data Optimized
FCC:	Federal Communications Commission
G8:	The Group of Eight: Canada, France, Germany, Italy, Japan, Russia, the U.K., and the U.S.
gTLD:	Generic Top Level Domain
HDTV:	High Definition Television
ICANN:	Internet Corporation for Assigned Names and Numbers
ILEC:	Incumbent Local Exchange Carrier
IM:	Instant Messaging
IP:	Internet Protocol
IPES:	Information-Processing Equipment and Software
IPO:	Initial Public Offering
IPTV:	Internet Protocol Television
IRS:	Internal Revenue Service
ISP:	Internet Service Provider
IT:	Information Technology
kbps:	kilobits per second
LCD:	Liquid Crystal Display

M&A:	Mergers and Acquisitions
Mbps:	Megabits per second
MSN:	Microsoft Network
n/a:	not available or not applicable
NTP:	Network Time Protocol
OECD:	Organization for Economic Cooperation and Development
OMB:	Office of Management & Budget
P2P:	Peer-to-Peer or Person-to-Person
PC:	Personal Computer
PDA:	Personal Digital Assistant
PPF:	The Progress & Freedom Foundation
RIAA:	Recording Industry Association of America
SDSL:	Symmetric Digital Subscriber Line
TCP:	Transmission Control Protocol
TLD:	Top Level Domain
UNE:	Unbundled Network Element
VoIP:	Voice over Internet Protocol

